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ELECTRIC LIGHTING AND THE NEWINGTON VESTRY.

Our readers are aware that the majority of the Newington Vestry is in favour of spending £20,000 in lighting up a small area in this district of London. The licence obtained for this purpose under the Electric Lighting Act of 1882 was opposed by a few vestrymen who enlisted the sympathies of a large number of the inhabitants of the neighbourhood. On Saturday, the 21st ult., Major Marindin held an official inquiry to hear the objections raised against the proposed scheme. The opposition was, however, weak in the extreme, and the evidence advanced by the witnesses called was the veriest twaddle. We may therefore conclude that if the report to be made by Major Marindin to the Board of Trade is in favour of the Vestry's proposed undertaking, the matter will be carried through. We published a short time since—see Electrical Review for June 9th—the estimate compiled by the Vestry for this experiment, and also a second one from a company prepared to do the work at a cheaper rate; but as the work—if entered upon—will probably be carried out by the authorities of Newington themselves, we need not refer to the company's offer. The number of incandescence lamps to be employed is 6,000, the current is to be supplied by four dynamo-electric machines capable of supplying 1,500 lamps each, and the motive-power will be obtained from four 150-H.P. steam-engines. The supply of electricity is to be for both public and private purposes within the chosen area. The undertaking, if ever carried out, will be by no means a light or easy task, and it does not appear as if the Vestry was fully alive to the difficulties attached to such a comparatively large installation. Whilst fully appreciating the courage and resolution of those who are in favour of the project, and who desire so earnestly to bring the matter to a successful issue, we cannot shut our eyes to a certain want of completeness in the technical details of the enterprise.

If we compare the proposed installation with that of the Edison system on the Holborn Viaduct, with its 800 lamps or so, we find that the probabilities are in favour of a complete breakdown several times in a year. If the latter system collapses completely five times during twelve months, for periods of more or less duration, in spite of its duplication of machinery and the extreme care and attention lavished on every detail connected with the subject, the chances are that the proposed experiment in Newington will suffer equally at least. We simply bring this topic forward because we do not observe that any provision has been made in the Vestry's estimate for eventualities of this kind, either by duplicating the machinery, or by the use of secondary batteries. Again, the amount set aside for contingencies is less than 5 per cent. of the total sum to be expended, a percentage far too small. The annual expenditure for horse-power—£1,690—is also, we think, much below that which will be found the actual figure in practice, unless indeed the whole of the lights are kept in operation for two hours per day only, or half the number for four hours per day throughout the year. But if the electric light is to be supplied to customers of all classes for use as they now employ gas, it seems to us that the average duration of lighting for *all* the lamps will be considerably in excess of these figures. Had the opponents of the Vestry brought forward facts like the above, Mr. Littler, Q.C., who appeared on behalf of the Vestry, could not have placed the scheme before Major Marindin in quite such a roseate hue. As it was, the opposition evidence was confined to a few apparently irresponsible persons who either did not consider the electric light necessary yet, or who had got the idea into their heads that it was only intended for the benefit of a few shopkeepers in one or two of the principal streets. Other signatories against the introduction of the light into the parish, were told that the effect of the Vestry's undertaking would be to increase the rents, and the evidence, generally of the most flimsy nature, seems to have been manufactured for the occasion. Why no scientific experts were examined is a mystery to us, and the Vestry's opponents have only themselves to thank for appearing in a ridiculous character. Before saying anything further on the subject we must await the result of Major Marindin's report, which may or may not be favourable to the introduction of electric lighting in the south-east of London.

Since the foregoing portion of this article was in type, we see it notified that the Board of Trade, after having considered Major Marindin's report, has decided not to sanction the Vestry's scheme. Whatever may have been the chief reasons for the decision of the Board of Trade, we feel convinced that the opposition offered to the Vestry did not affect it, and it is therefore most likely that the Board may have felt that the Vestry was not in a position to carry the matter through successfully from some such causes as we have above considered.

UPON AN UNIVERSAL DEAD-BEAT GALVANOMETER FOR THE RAPID MEASUREMENT OF STRONG CURRENTS OR HIGH TENSION.

Note by M. DUCRETET, presented by M. C. WOLF.*

The tangent galvanometer under consideration possesses the advantage of giving almost instantaneous indication of the strength of currents. This valuable property is obtained by the suppression of the oscillation of the needle which is completely immersed in a transparent liquid contained in a compensation box like those already used for marine compasses. This arrangement, which may be adapted to any kind of galvanometer, stops the oscillation much more quickly than the copper buffers or powerful magnets sometimes employed, and it leaves the needle all its sensitiveness.

It follows from this: 1st, that in the study of batteries we may obtain the value of the intensity current strength or of the electromotive force before the phenomena of polarisation are produced, although they are produced very rapidly when the battery is closed by a circuit of no resistance, as in the case for the measurement of current strength. 2nd, that we may follow, step by step, all the variations of the current, weak or strong, slow or rapid, an observation which is valuable for the study of the currents from batteries, and especially for those from magneto-electric machines.

The magnetised needle, of very small dimensions, is supported by an agate cap upon a very fine non-oxidisable point;

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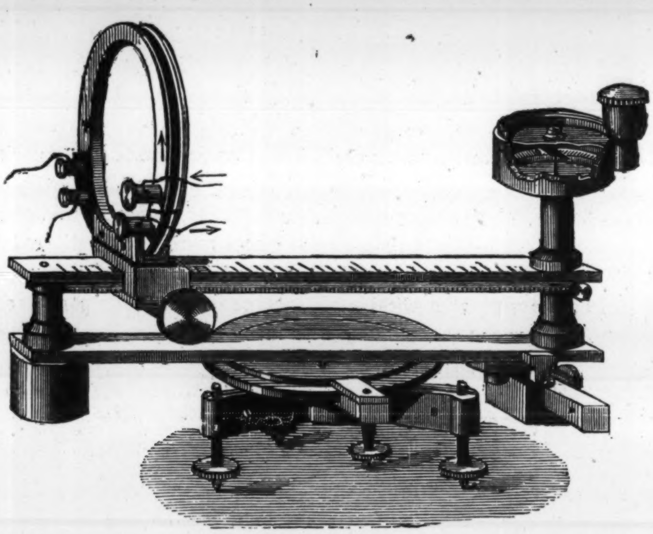
* *Comptes Rendus.*

it is lengthened by a very thin stem of aluminium which points to the divisions of the dial. The bottom of the box is formed of a platinised mirror, the index of the needle is reflected there and the superposition of the index to its image prevents any error of parallax.

The box containing the needle is mounted at the centre, at the end of a graduated scale, movable itself upon a vertical axis. A powerful magnet, acting as a directing magnet, may be fixed below the needle; its action is added to the directing action of the earth, and constitutes a tolerably intense magnetic field, which renders the external variations scarcely perceptible. The circular multiplying frame is movable along the rule, and may be brought rapidly to any distance from the needle by means of a rack and button. Owing to this arrangement the galvanometer may be employed for the measurement either of the strength of currents or the electromotive force of batteries within extensive limits, from one-tenth of an ampère to about 400 ampères, and from one-tenth of a volt to 700 volts and upwards for electromotive force.

In the first case (ampèremeter) we make the current pass through the frame of the multiplier itself, the resistance of which is inappreciable. We determine, by experiment, a table of values corresponding to the degrees of the dial, according to the various positions of the frame upon the scale and the value in ampères of the current which traverses it. Experiment shows that there is direct proportionality up to 35° between strengths and deviations.



When it is employed as an electromotive force galvanometer or voltmeter, we pass the current through a very fine wire coiled round the frame and presenting a very great resistance—5,490 ohms. The strength of the current is then very nearly proportional to the electromotive force. We calibrate the apparatus in volts for the various positions of the frame. Proportionality between the electromotive forces and the degrees of deviation is maintained up to about 35°.

It is necessary to frequently test the apparatus, which may vary in consequence of variations of the horizontal terrestrial conditions and of the directing magnet. This verification is made by putting in circuit a large Daniell element, of which the electromotive force is known and of which we determine the resistance.

TECHNICAL EDUCATION.

THE readers of this journal will probably exclaim, on casting their eyes at the head of this article, "Another communication on this commonplace and thread-bare subject." I agree with them that the topic of technical education is trite and commonplace, and that it has been worked upon to such an extent that it seems well-nigh exhausted and worn to the naked thread. Nor do I expect to add very much that is either new or striking to a theme on which so many able pens have written so wisely and well. Long, indeed, had it been viewed with apathy by all classes of society in this country, whilst our continental neighbours, alive to its value and importance, were making rapid strides in advance of us, until at length the danger of losing our own, as a manufacturing people, among the nations of the earth was brought home to our very doors and then, and not till then, did we arise from our lethargy and torpor, and begin to bestir ourselves to secure to our artisans that sound theoretical and practical acquaintance with the sciences bearing upon their particular handicrafts or trades which would place them on an equal footing with their foreign competitors and rivals in the race.

All honour to those who have so devotedly laboured and so persistently striven to bring about this desirable result. None will detract from their merit or begrudge them their due meed of praise, but one is sometimes led to question whether the subject is not now pressed beyond its legitimate limits, so that in avoiding one extreme we are thrust upon the opposite one, and whilst escaping from Scylla we are in danger of falling into Charybdis.

Judging from the views and sentiments of the ultra advocates of technical education, we might almost conclude that the physical and collateral sciences were the *summum bonum*, the substance or quintessence of all desirable human knowledge, and an acquaintance with them a panacea for all intellectual ills. Now, I do not wish to dispute or underrate their value as a potent factor in the education of the people, but in my judgment they form a part, and only a small part, of the curriculum which is necessary for the full development of the mental faculties and the production of the perfect intellectual man.

If I may be allowed to borrow a simile from our bodily necessities, I should say that the physical sciences are the pabulum of the mind. But as the body requires exercise as well as food in order that the process of digestion and the other animal functions may be properly performed, so also the mind without a stimulus which shall draw forth all its latent energies will simply wither and decay amidst an abundance of intellectual food with which it may be surrounded.

If we are asked what we consider to be the means the most appropriate for the exercise of the mental faculties, we reply, *languages* and *mathematics*, both duly proportioned so as to balance each other, whereby that well-regulated mind will be produced which is an inestimable benefit to a man, whatever station in life he may be called to fill.

Mathematics, we all know, is a powerful agent in mental discipline. It is not necessary in order for it to have this effect to penetrate into the higher orders of this branch of study. A youth who has a thorough knowledge of arithmetic, has mastered the elements of algebra (say, the first part of Colenso's work), and is also acquainted with Euclid and plane trigonometry, has received a mathematical training which, irrespective of its intrinsic value as an addition to his stock of knowledge, will leave its mark indelibly impressed upon his mental organisation. Apart from the fact that it produces an indomitable perseverance in overcoming difficulties, it also creates in the subject of it a feeling of confidence in his own powers which will be of great help to him in after life in his subsequent dealings with men and things.

The student, however, who wishes to derive the utmost advantage which mental discipline is capable of yielding should not confine his exercise to mathematics. He must combine with that fascinating branch of learning some other disciplinary study which will call another part of the brain into activity; and the study which most commends itself for this purpose is *languages*.

It is not, indeed, requisite in order to derive the advantages which philological pursuits are able to impart that a youth should devote any very large portion of his time to what are termed the *classics*, if he forms an acquaintance with the principal Latin and Greek roots which enter into the words of his mother tongue it will probably be quite sufficient for his purpose under this head.

Modern languages must, however, engage a larger share of his attention. In sketching out a course of philological study I would lay down as a basis a general knowledge of the various stocks and families of languages, and then proceed to the two families which are immediately connected with English, viz., the *Teutonic* and the *Romance* languages. Side by side with the study of English the pupil should take German as the most important member of the Teutonic family, and French as the most important member of the Romance family, and thoroughly master them. Having proceeded thus far he might easily acquire some useful knowledge of the cognate Teutonic tongues—Dutch, Danish, and Swedish, and of the sister Romance languages—Italian, Spanish, and Portuguese.

This may seem at first sight a formidable curriculum, but I am persuaded under a proper system of tuition it might be easily acquired.

A youth who is undergoing this process of mental training will derive the greatest amount of advantage from his scientific studies. Just as healthy physical exercise gives a zest to the appetite and a relish to the food taken for the support of the bodily frame and promotes its digestion, so under the mental discipline which combined mathematical and linguistic training yields, the student not only seeks with avidity mental pabulum in the shape of scientific facts, but is enabled to thoroughly digest and assimilate it. On the other hand the youth who is spending the whole of his time in scientific studies is, as it were, surfeited, as from the lack of a proper discipline of his mental faculties he cannot digest and derive that full benefit from his acquisitions which in their nature they are calculated to afford.

It is to this want of mental discipline must be attributed that inability which we sometimes observe in scientific men to express their ideas upon any subject with clearness and perspicuity. Their familiarity with scientific matters is unquestioned, but from defects in mental education their mode of expressing their ideas is so confused that it is impossible to derive from them the full benefit of that knowledge which, with greater ability in exposition, they would be so well qualified to impart.

These facts should be taken to heart by those interested in the great educational problems of the day. In this matter I would inculcate a liberal conservatism which, whilst adapting itself to the changes called for by the ever-varying phases of our national life, will tenaciously adhere to the old lines—those time-honoured agencies for mental development which have formed our great statesmen, lawyers, and divines, in short, all those who have distinguished themselves in the annals of their country or left their mark upon the world.

T. J. HANDFORD.

Telegraphic Extension.—The French Government is negotiating with the Eastern Extension China Telegraph Company for the laying of a submarine cable between Cochin-China, Tonquin, and Saigon. The company offers to lay down and work the cable for 250,000 fr. a-year, but the products of the private dispatches which will belong to the French Government, and the reduction of one-half in telegrams for the French Government south of Hong Kong and Australia, are estimated to reduce the annual cost to 165,000 fr.

REMARKS ON THE CONSTRUCTION OF INDUCTION MACHINES.*

By Dr. ST. DOUBRAVA.

As is well-known, Faraday succeeded in 1831 in discovering induction and its laws. I will not discuss his experiments, but merely repeat the general proposition on induction:—"If a conductor moves in a magnetic field so as to intersect the lines of magnetic force, a current is produced in the conductor; if it moves parallel to the lines of force no current is produced." Upon the basis of this law Faraday constructed the first machine for converting mechanical into electric energy. This apparatus, which Faraday called a "magneto-electric machine," consisted of a copper disc which rotated between the poles of a strong steel magnet or electro-magnet. If Faraday connected the axle of the disc with the circumference he obtained a current which passed either from the axle to the circumference, or inversely, according to the direction of the rotation. The machine, therefore, gave a continuous current. Faraday recognised at once, with his penetrating mind, the importance of this machine, for he says: "It is quite true that the force of the current thus evolved has not as yet been increased so as to render it available in any of our ordinary applications of this power; but there appears every reasonable expectation that this may hereafter be effected, and probably by several arrangements." A year afterwards, Pixii in turn constructed an induction machine. If we compare it with that of Faraday we cannot avoid coming to the conclusion that it shows no improvement. Of a continuous utilisation of the magnetic fields by a current in the same direction nothing remains. The same error was committed by all subsequent makers of induction machines. If we compare the inductors until those of Pacinotti, Gramme, and Hefner-Alteneck we see that they have all one common idea. In all, wire coils are approximated to magnetic poles and allowed again to recede. We may therefore say in substance that the coils move in magnetic fields. If a coil moves through a magnetic field, mechanical work is transformed into a current, but if the coil moves through a non-magnetic field there is no transformation, and the machine is void. It will be readily perceived that this discontinuous utilisation of the magnetic field corresponds to a considerable loss of work, as is really the case in machines for reciprocating currents, where the error reaches its maximum. We shall discuss other faults below.

The above error is mainly avoided in the Pacinotti-Gramme "ring-inductor" and, in its modified form, the Hefner-Alteneck "drum-inductor." That the faults have hitherto not been entirely obviated is chiefly due to the circumstance that we have not arrived at these inductors in a direct manner and by perfectly correct considerations. The thought has still hovered in the minds of manufacturers that a current can be induced only when a conductor approaches to, or recedes from, a magnetic pole. In this manner both inductors are explained in books. I will assume the present mode of explanation as perfectly well known, and will show that the two above-mentioned inductors are nothing else than improved Faraday's disc inductors.

If a Faraday's disc moves over a magnetic pole, currents are produced in it, which, according to the sign of the pole and the direction of the rotation, pass either from the axle to the circumference, or inversely. If the edge of the disc is not in conductive connection with the axle, the currents in the disc compensate and annul each other. To prevent this compensation in the disc, let us suppose the disc consisting of portions radially insulated from each other, as is shown in fig. 1. The dotted circle, A, shows the magnetic pole; in this case the currents must pass perfectly radially. Let us now take a disc in contact with two opposite poles, A, B (fig. 2). The currents have an opposite direction in both parts. If we apply to the ends of the radial conductors the sliding contacts, C, D, E, F, and G, H, I, K, which for the sake of distinctness are represented as at a little distance from the ends of the conductors, and if we connect together conductively the indifferent points, L and M, a continuous current passes through this connection as long as the disc rotates. We see already that in this modification of Faraday's disc is involved the fundamental idea of all inductors for continuous currents. In order to avoid the troublesome contact at the circumference, the single conductors can be so connected together that the contact is removed to the axle. At the same time by such arrangements the single partial currents can be brought into succession. Fig. 3 shows such a connection.

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* "Internationale Zeitschrift für die Electrische Ausstellung in Wien."

It will be perceived at once that this is the connection of the Hefner-Alteneck "drum-indicator." If two such discs are placed along side each other, so that the arrangement of each presents, so to speak, the reflected image of the other, then if the discs rotate in the same direction currents of opposite directions are produced in the corresponding parts. If the radial conductors of the two discs are connected as in fig. 4, we have the "ring-inductor" of Pacinotti and Gramme.

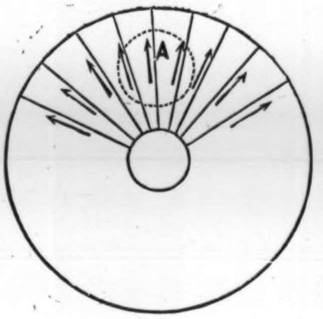


Fig. 1.

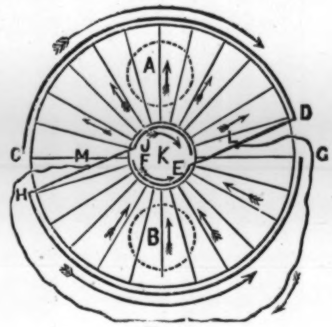


Fig. 2.

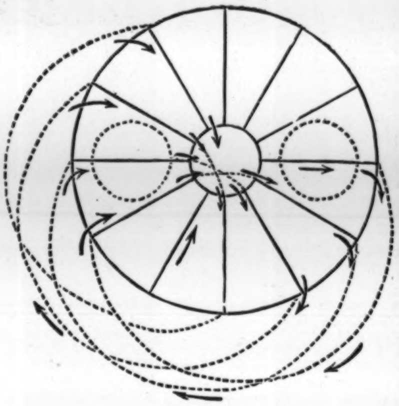


Fig. 3.

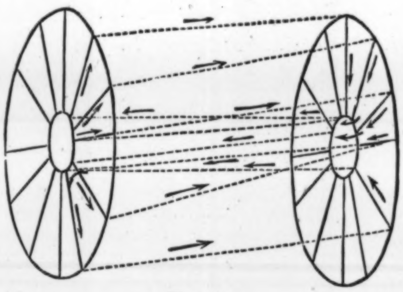


Fig. 4.

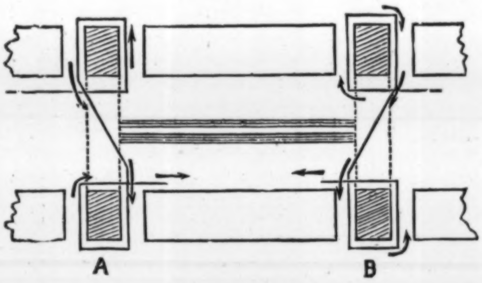


Fig. 5.

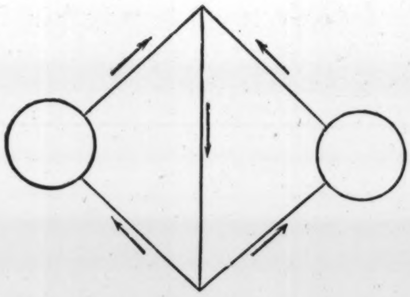


Fig. 6.

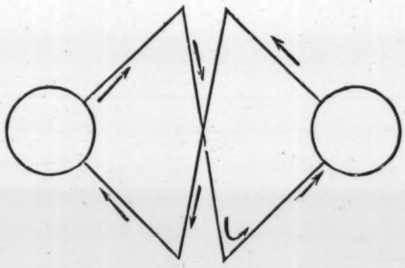


Fig. 7.

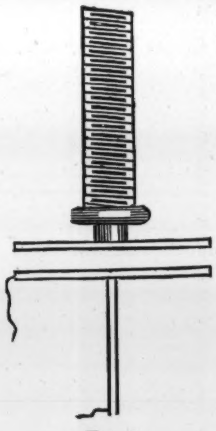


Fig. 8.

From what has just been said the difference between the explanation of induction machines, as ordinarily given, and that here laid down will be tolerably clear. According to the former explanation the current is induced of the approximation of a conductor to a magnetic pole, or its recession from such pole. According to the second interpretation it is merely required that a conductor moves in a magnetic field and intersects the lines of magnetic force. At first sight both explanations may seem as merely different apprehensions of one and the same fact. On closer consideration we find, however, that between the two there exists a difference in principle. According to the first explanation it is required that the conductor should move from points of greater magnetic potential to points of less magnetic potential, or inversely. According to the second explanation this is unnecessary. A conductor moving in a plane at one and the same magnetic level produces a current. We see now easily what part is played by the soft iron core in the inductor. It does not serve to produce a moving pole, but to increase the intensity of the magnetic fields. We may compare the soft iron core placed between both pairs of poles with the external and mutually connected coatings of an electric double jar.

I will now show how, proceeding from the explanation just given, some of the defects which hitherto adhered to induction machines may be removed. I refer to the rapid change of poles in the soft iron core and the non-continuous collector which involves the production of injurious sparks. If the rings, A, B (fig. 5), mutually connected by an axle of soft iron move between two equal magnetic poles as shown in the figure, no change of polarity takes place in the rings. The currents arising in the coils are shown by arrows. As in this case the currents are not conducted away from a point of indifference the non-continuous collector is dispensed with.

The two rings can either be connected side by side as in fig. 6, or one behind the other as in fig. 7. A similar construction has been already patented by Etienne, but how his machine is constructed and what ideas led him to such construction does not readily appear from the brief abstract of his specification which I have at hand.

I may here remark that long before the publication of Etienne's patent, Herr W. Hervert, of Prague, and myself had made many experiments on this subject. In order to satisfy ourselves that the rotation of a disc in a magnetic field without a change of polarity is sufficient to produce radial currents in the disc, we instituted the following experiment: in front of the pole of a powerful electro-magnet we placed a circular disc of soft iron (fig. 8), and parallel to it a copper disc. If it was made to rotate, there arise in it currents according to the sign of the pole and the direction of the rotation, either from the axle to the circumference or inversely. We see that by combining two such discs in the manner previously mentioned, it is really practicable to construct a unipolar ring machine. Further experiments were made to ascertain if it was possible to produce a magnetic field by means of masses of soft iron, independent of any magnetic masses outside the said masses of soft iron. All experiments of this kind had a mere negative result. One of them was the following: we allowed the disc of soft iron, which had been carefully annealed, to revolve before the copper disc. If the magnetic field behind the disc was independent of the magnetic pole before the disc, then, on the rotation of the disc, *i.e.*, by the movement of the magnetic field, currents would be produced in the disc, for it is one and the same thing whether the disc rotates in the magnetic field, or the magnetic field moves in the opposite direction. If the disc is allowed to rotate along with the pole, the phenomenon actually ensues, but if the disc is caused to rotate alone, not the slightest trace of currents can be perceived in the copper plate, a proof that the magnetic field behind the disc is not independent. Hence the currents which would be expected in the copper disc take their rise in the iron disc, as may be easily demonstrated.

I will now present a theory of induction machines based upon the explanation above given, and in many respects in perfect accord with practice. We suppose a linear conductor of the infinitely small length $d\,s$ moving through a magnetic field. According to the researches of Faraday we may now assume that the electromotive force in action at its ends is proportional to—

1. The intensity of the magnetic field;
2. The number of the lines of force which the conductor intersects;
3. The speed with which it moves in the magnetic field.

The number of the lines of force which traverse the conductor when it intersects them perpendicularly may be assumed = 1 for the unit of length the number of lines of force which traverse a conductor of the length $d\,s$, when it intersects them at an angle ϕ is given by the expression ds sine ϕ. If we call e the electromotive force, M the intensity of the magnetic field, and v the velocity of the moving conductor, then, according to the above, $e = \mathrm{M}\, v\, ds \text{ sine } \phi$.

If a conductor of a finite length moves through the magnetic field, we find the electromotive force active at its ends, E, by integrating over the entire conductor—

$$\mathrm{E} = \int \mathrm{M}\, v\, ds \text{ sine } \phi.$$

If we connect the ends of the conductor by a second conductor, which we assume as at rest and therefore electromotively inactive, there arises a current, the intensity of which J is—

$$\mathrm{J} = \frac{\mathrm{E}}{\mathrm{W}},$$

where W signifies the resistance of both conductors. If we suppose v constant for all parts of the conductor we have—

$$= \frac{v}{\mathrm{W}} \int \mathrm{M} \text{ sine } \phi\, ds = \frac{v}{\mathrm{W}}\,\mathrm{C}.$$

As the integral, $\int \mathrm{M} \text{ sine } \phi\, ds$, as is readily seen, has always a finite value, the intensity for the same conductor and the same magnetic field depends merely on the proportion, $\frac{v}{\mathrm{W}}$. This result has been found by Froehlich in another manner and experimentally confirmed.

If we suppose a homogeneous magnetic field and a rectilineal conductor

$$\mathrm{J} = \frac{v}{\mathrm{W}}\, \mathrm{M} \text{ sine } \phi \int ds = \frac{v}{\mathrm{W}}\, \mathrm{M}\, l \text{ sine } \phi$$

l signifying the length of the conductor which moves through the magnetic field. If v, M, and W, remain equal, J is greatest when sine $\phi = 1$, *i.e.*, when $\phi = 90°$. Then

$$\mathrm{J} = \frac{v}{\mathrm{W}}\, l\, \mathrm{C}.$$

If the lines of force are intersected by the conductor at right angles the electromotive force is greatest, a result which was experimentally ascertained by Faraday. If the conductor does not intersect the lines of force perpendicularly, we may always suppose it replaced by a conductor of the length l sine ϕ, which does intersect the lines of force at right angles. The electromotive force of both conductors is the same; but as the second conductor is shorter, then, other circumstances being equal, its resistance is smaller and the intensity of the current is greater. A farther advantage of such arrangements where the conductor intersects the lines of magnetic force at right angles is the smaller loss of energy.

Suppose that both machines produce a current of the intensity J, there is developed in the first machine a quantity of heat Q_1.

$\mathrm{Q}_1 = k\, \mathrm{J}^2\, l$, and in the second $\mathrm{Q}_2 = k\, \mathrm{J}^2\, l \text{ sine } \phi$.

In the first machine, other conditions being equal, more energy is converted into heat, the excess of loss being equal to $k\, \mathrm{J}^2\, l\, (1 - \text{sine } \phi)$, k signifying a constant.

The more ϕ deviates from a right angle the greater is the loss of energy. Hence we see that in the construction of induction machines we must not aim at complicated forms of the inductor, simple ones being always better, as in them it can be more readily perceived whether the conductor intersects the magnetic lines of force at right angles or not. The two conditions are well observed in the Pacinotti-Gramme ring inductor, and especially in Schuckert's flat ring, in Hefner-Alteneck's drum-inductor, and altogether in all the inductors which are capable of being reduced to Faraday's disc inductor. The reciprocating current machines are worst arranged in this respect, having the heaviest load of materials which are electromotorically useless.

All that has been said applies merely to those induction machines in which the magnetic field remains constant, being produced by a steel magnet. The whole consideration must be somewhat modified for dynamo-electric machines. On starting the machine the intensity of the magnetic fields is a function of the intensity of the current; we have then

$$\mathrm{J} = \frac{v}{\mathrm{W}} \int f(\mathrm{J}) \text{ sine } \phi\, ds$$

or

$$\frac{d\mathrm{J}}{ds} = \frac{v}{\mathrm{W}}\, f(\mathrm{J}) \text{ sine } \phi$$

$$\frac{d\mathrm{J}}{f(\mathrm{J})} = \frac{v}{\mathrm{W}} \text{ sine } \phi\, d\,s.$$

If we put $f(\mathrm{J}) = c\,\mathrm{J}$, c being a constant and again assume a homogeneous magnetic field and a rectilinear conductor, we have

$$\frac{d\,\mathrm{J}}{c\,\mathrm{J}} = \frac{v}{\mathrm{W}} \text{ sine } \phi\, d\,s$$

$$\text{log. nat.}: \mathrm{J} = \frac{e\,v}{\mathrm{W}} \text{ sine } \phi\, l$$

or

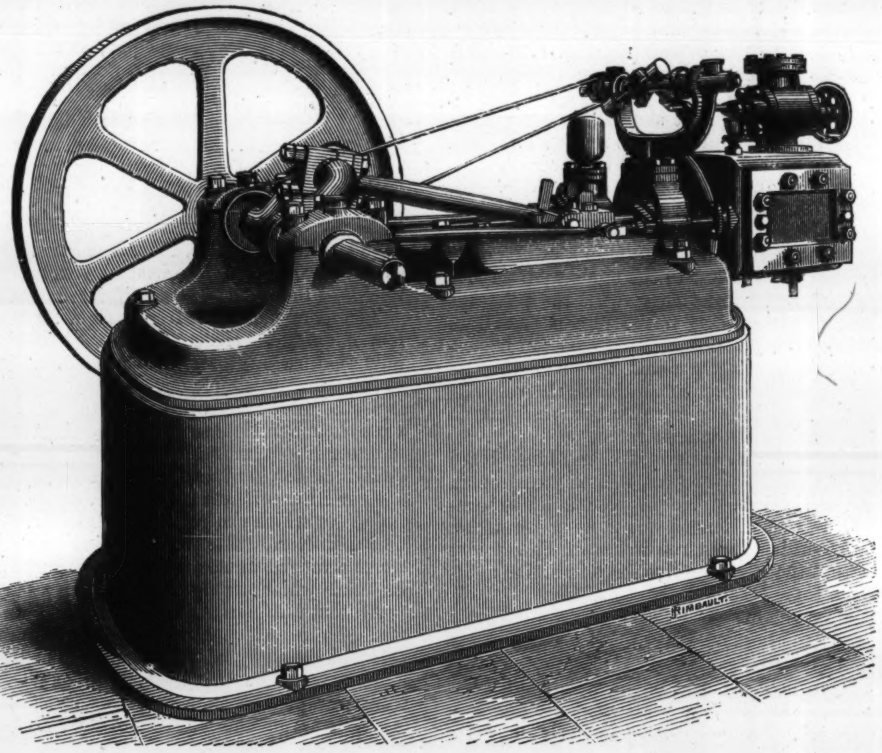
$$\mathrm{J} = e^{\frac{e\,v}{\mathrm{W}} \text{ sine } \phi\, l}.$$

If the field becomes stationary, the dynamo-electric machine is placed under the same conditions as a magneto-electric machine. If the resistance changes the intensity of current changes, and with it the magnetism. It will be seen that at each such change the same phenomenon must occur as on starting the machine.

The deductions hitherto given are, however, merely approximately correct, since it has been assumed that the magnetic field does not change after the appearance of the current, which is not the case. The incipient current affects not merely the intensity of the magnetic field (also in magneto-electric machines), but it alters the direction of the lines of force. In how far regard should be had to these phenomena will be discussed in a future communication, which will also take into consideration the proportion of the transmitted energy to the weight of the wire in a dynamo machine.

ENGINES FOR ELECTRIC LIGHTING.

THE engines now most extensively used for electric lighting purposes by such famous makers as Peter Brotherhood, Robey and Co., Ruston, Proctor and Co., Davey, Paxman and Co., Marshall and Sons, Hodson, and several others, have firmly established their reputation, and are as well known to electrical engineers as the dynamo-electric machines they are intended to drive. It is natural to expect that other candidates offering their engines for the favourable consideration of those directly responsible for any fresh electric lighting installation will be from time to time forthcoming. Our illustration shows a horizontal engine with inside crank by Messrs. Lane and Reynolds, of London, which is said to be particularly well adapted to electric lighting purposes. They are manufactured to meet the demand for a high-class engine at a moderate price, and range from 2½ to 8 nominal horse-power. We have no experimental data of the performance of these engines, and therefore cannot say how they compare with better known types; we therefore await an opportunity for publishing authoritative tests.



South Wales Institute of Engineers.—At the general meeting of the members of this institution, held at Cardiff the week before last, Mr. Sydney F. Walker, M.S.T.E., read a paper on "The Principles of Electric Lighting and Transmission of Power by Electricity."

THE TELEPHONE SITUATION IN AMERICA.

A CORRESPONDENT has been good enough to forward us a pamphlet issued by the United States Telephone Manufacturing Company of New York, which he thinks will afford our readers information in addition to that which we published last week. Our informant further states that the company is composed of gentlemen of the highest respectability and that the pamphlet is a simple statements of facts. It is dated New York, June 12th, 1883, and commences thus:—

"THE UNITED STATES TELEPHONE MANUFACTURING COMPANY.

"Patents having been issued to James W. McDonough, of Chicago, the *original inventor* of the telephone, covering and controlling the instruments now used by the American Bell Telephone Company and its licencees, this Company owning the same and also patents controlling the Central Office Systems and improvements thereon, including the Automatic Central Office Switch are prepared to issue licences for their exclusive use in cities, counties and states; these licences will, if desired, secure to the owners thereof the monopoly of the telephone with a term extending many years beyond the life of the American Bell Telephone Company's patents.

"Local suits can be bought by the owners for these licencees to compel the discontinuance of the use of the telephone by others in the district covered by the same; or, a decision in either of the suits brought by this company and now pending against licencees of the Bell Company for infringements will place the existing telephone interests of the country at once in such a position as to make them dependent for continuance upon whatever arrangement the owners thereof may be able to secure from the licencees of this company. Exchanges and all others using the telephone in this country to-day, are doing business upon the precarious tenure of rights granted by virtue of the patents of Mr. Bell, *who is not the original inventor*, and the doubtful guarantees given by the American Bell Telephone Company.

"When the Bell Telephone Company discovered that McDonough's invention antedated Bell's and that the documents and evidence in the Patent Office sustained this fact, they opened negotiations with him. On his visit to Boston, he told them plainly that Mr. Bell must 'step down and out.' —and although well aware that the facts known to themselves fully warranted this, their pride rebelled and the evidence in the history of this remarkable negotiation indicates that an attempt was then made on their part to place him in a position which would prevent him from obtaining his patents; but all the arts employed by them to effect their object have gained them nothing, and controlling patents have been issued to McDonough.

"The *immense property* that the local telephone companies and others have built up under grants guaranteed by the Bell Telephone Company, aggregating in value more than one hundred millions of dollars, is now dependent for security simply upon the ability of the lawyers of the Bell Telephone Company to devise technicalities and obstructions with which to stave off the issue with McDonough's patents. It will be readily seen that this is very slender security for the money invested.

"The United States Courts will sweep away these subterfuges and are bound to decide in favour of the original inventor, especially when the proof is so clear and complete as it is in this case.

"This company also owns the patents issued to George W. Coy, of Connecticut, the first to devise and put into operation the telephone exchange system—these patents cover all the combinations employed in the telephone exchanges throughout the United States.

"Included in the patents owned by this company, are those also of Connolly and McTighe, for the automatic exchange switch system, the claims of which are fundamental and broadly cover every possible way of working a central office switch automatically.

"The company also owns numerous patents issued to George W. Coy, Charles E. Buell, James G. Smith, Joseph H. Olmstead and others, aggregating upwards of sixty patents completely covering telephones, transmitters, central office systems, way station switches and devices, telephone repeaters, duplex telephones, &c., &c.

"On some of these controlling patents suits for infringement have already been brought in New York, Massachusetts, and Connecticut, against the exchanges operating under the licences given by the Bell Telephone Company. Parties licensed by this company will be entitled to bring local suits in territory owned by them, and close the existing exchanges or *compel them to pay tribute* to such licencees of this company for the continuance of their business.

"On the 10th day of November, 1879, a contract was entered into between the Bell Telephone Company and the Western Union Telegraph Company and others, which has very seriously restricted the public use of the telephone, preventing the telephone company from extending to its patrons the advantages of the telephone, for communicating between cities, greatly to the disadvantage of individual and business interests, and only serving to materially aid in building up the monopoly of the Western Union Telegraph Company. As the United States Telephone Manufacturing Company has not entered into any such complicated alliances, the use of the telephone between cities and towns for all purposes now opens up an additional and very extensive field; one which threatens eventually to supersede the telegraph itself for prompt and cheap communication between distant points.

"This company owns the only long line telephone systems especially adapted for this purpose—and which have been tested and proved to be eminently practicable.

"STATEMENT.

"The Records of the Patent Office show that Mr. James W. McDonough, of Chicago, Ill., before the 31st day of December, 1867, invented and constructed a telephone receiver, consisting of the combination in an electric circuit of an electro-magnet and a diaphragm, supported and arranged in close proximity thereto whereby sounds thrown upon the line were reproduced accurately as to pitch and quality.

"On the 26th day of August, 1871, Mr. McDonough made a drawing of a telephonic transmitter and receiver, also of the circuit with battery included, showing how to use them, 'for the transmission of speech through wires by means of electricity,' substantially as used by him experimentally in the year 1867, as above stated.

"Early in May, 1875, Mr. McDonough constructed and practically operated a telephone by means of the human voice, and an electric current through wires connecting a diaphragm contact electrode transmitter with a diaphragm receiver, with an electro-magnet in close proximity thereto.

"During the summer and fall of 1875 Mr. McDonough made a number of modifications of his apparatus, and on the 10th day of April, 1876, filed his application in the United States Patent Office, boldly claiming the reproduction of articulate speech by means of electricity. Moreover, he devised a title to typify his invention, calling it a teleloge—which signifies 'far-speaker.' In reality a more significant and appropriate title than 'telephone,' the latter signifying far-sounder.

"*No one* before that time had made the claim of having even constructed an apparatus which could be made to reproduce speech by means of electricity, and James W. McDonough stands as the *first person* before the world* and the Patent Office as the enunciator of the fact that he had discovered the art of transmitting articulate speech by electricity, *and made a successful working apparatus.*

"In the same year (1876) Mr. Bell filed an application for a method of transmitting two or more telegraphic signals simultaneously over a single wire, to enable several telegraphic dispatches to be transmitted at the same time, but no disclosure was made that would lead any person, even the most skilled in electrical matters, to know that the invention described was for a speaking telephone, much less to enable persons so skilled to have made a speaking telephone from the drawings and description given. *In fact, in a critical suit recently concluded in England, the high court of that country decided positively that this* 1876 *patent of Bell's did not disclose the invention of a speaking telephone.*

"The first application filed by Mr. Bell for the transmission of articulate speech, or for any instrument capable of such transmission, *was on January 15th,* 1877, *more than nine months after McDonough had filed his application, accompanied by working models capable of illustrating his claim.*

"Mr. Bell's patent was issued to him on January 30th, 1877, *fifteen days only*, after his application was filed, without being first put into interference with McDonough, but *after* such issue to Bell, an interference between Bell and McDonough was declared.

"When Mr. McDonough filed his case there was *no one else in the office showing such an invention*, yet while he was patiently waiting for the issue of his patent, Mr. Bell steps in with an application, and within the brief space of 15 *days had his case issued to him*, and he has paraded before the world ever since as the original inventor. It only remained after this to get Mr. McDonough put into interference with an issued patent to hold him in the office for years, which was done.

"Thus, the man to whom *belonged the credit* of this important invention, as well as the *revenue therefrom*, has been unjustly kept out of his right for many years.

"Recently the Patent Office has allowed Mr. McDonough to divide his case, and has issued to him four controlling patents: *One for the receiving telephone, as now in general use; one for and controlling the transmitter, as now used; one for a combination of the transmitter and receiving telephone, and one for the removable diaphragm of the receiving telephone, as now in use.*

"As the *original inventor*, these patents will be sustained by the courts in their broadest scope; and while he will yet undoubtedly obtain through the same courts the broadest claims to the art covering any possible way of transmitting speech by electricity, these issued patents control the field, and will prevent others from using any of the now known methods of such transmission.

"The United States Telephone Manufacturing Company, organised under the laws of the State of New York, who are the owners of the McDonough patents, also own the patents of George W. Coy and Charles E. Buell, of New Haven. It is a well-known fact and beyond dispute that Mr. Coy was the inventor of the exchange plan or system now in use for utilising the telephone, and which completely overcame the then existing difficulty in bringing the telephone into universal use. He devised and put into operation at New Haven, Conn., the *first telephone exchange*, inventing and combining the necessary *circuits and apparatus* that has made the system so effective and popular throughout the entire world.

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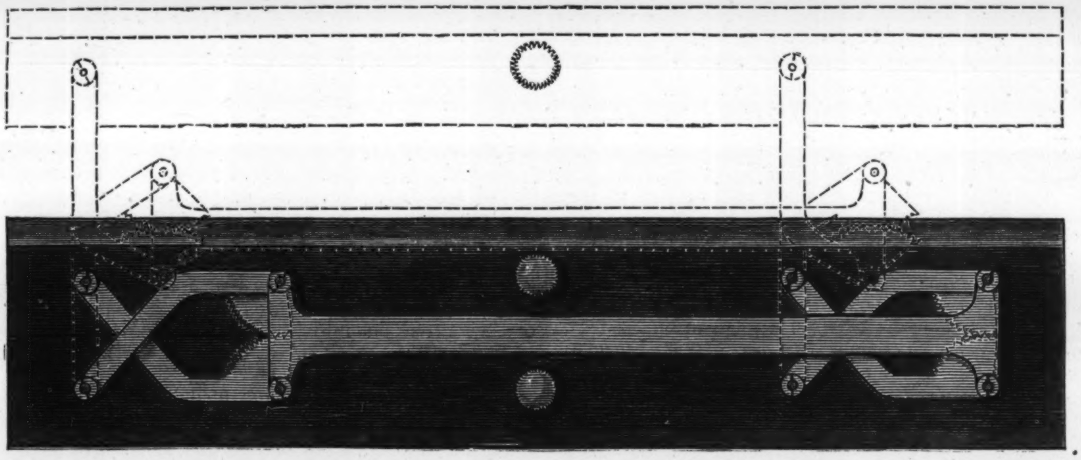
* The Company apparently is forgetful of the claims of Reis.—EDS. ELEC. REV.

"Upon these new and necessary combinations he applied for letters patent, which have been granted to him; these patents cover and control, to the fullest degree, the system now employed to operate any and all of the telephone exchanges in the United States.

"Every exchange from the smallest to the greatest are infringing these patents in a score or more of different points, and are all liable at law for damages for such infringements from the date of the patents."

A NEW PARALLEL RULER.

A NEW form of parallel ruler, which possesses considerable advantage over those at present in general use, has been invented by Mr. H. R. Kempe. This instrument, of which we give an illustration, possesses the steadiness and non-liability to slip which characterises the ordinary double bar form of ruler, whilst its path of traverse is perfectly straightforward as in the rolling form. For chart purposes, the new ruler is especially useful, whilst for ordinary work it will, we think, be much appreciated. The straightforward motion is effected by gearing together the links which connect the two ebony bars. One advantage which the new instrument possesses is that its length of traverse is nearly double that of the ordinary form.



REVIEW.

Philipp Reis, Inventor of the Telephone. A Biographical Sketch, with documentary testimony, translations of the original papers of the inventor and contemporary publications. By Silvanus P. Thompson, B.A., D.Sc. London: E. and F. N. Spon, 16, Charing Cross.

"To set forth the history of this long-neglected inventor and of his instrument, and to establish upon its own merits, without special pleading, and without partiality, the nature of that much misunderstood and much abused invention has been the aim of the writer. The thought that he might thus be of service in rendering justice to the memory of the departed worthy has inspired him to his task. He has nothing to gain by making Reis's invention appear either better or worse than it really was." The author, in his preface, thus most distinctly repudiates any wish to attribute to Reis more than is due to the latter. If it were not for this statement we should certainly say that Professor Thompson's motives were not disinterested ones, as we fail to see that he has established what he seeks to prove. In plain words, almost the whole object of the book is to prove that variation of resistance by surface contact between two substances, as applied to telephony, is really the invention of Reis, and the author's arguments to prove his case, although in our opinion utterly insufficient, are worthy of an eminent counsel. Did Reis design his invention to work by distinct makes and breaks only or by variation of resistance at the points of contact, or by both, in his transmitter? The evidence which Prof. Thompson brings forward confirms our opinion rather than shakes it that the former was the case. We have, many times repeated, most distinct statements such as the following: "In this way each sound-wave effects an opening and a closing of the current," "at every vibration of the membrane an interruption in the current of electricity takes place because the platinum point no longer touches the other strip of platinum." Such plain expressions as these, which run through the whole of the evidence, Prof. Thompson takes not the slightest notice of, but by a stretch of imagination, which has been heightened by the light of modern experience, he persistently, again and again, repeats that "electric mechanism, consisting of two or more parts in *loose or imperfect contact with each other*" was an intentional characteristic of the Reis transmitter. That the instrument *was* constructed with loose or imperfect contacts is undoubtedly true, but that such was Reis's intention we submit there is no evidence of any reliability to prove. The very fact that Reis chose *platinum* for his contact-points is a proof that he wished to obtain certainty and completeness in his makes and breaks, and to avoid anything like an *imperfect* contact.

The imperfectness and want of precision in expressing one's ideas on a new subject have often lead to misunderstandings, and have been taken advantage of by interested persons to prove a case against plain facts; and in the case of the Reis apparatus there has been no exception to this course. That Reis quite understood the general nature of the problem to be solved Prof. Thompson has quite proved, but that he discerned the means of carrying out the requirements in anything like completeness is certainly not proven. Great stress is laid upon the use of the word "tone," which Prof. Thompson points out is the German word "ton," and is more nearly equivalent to the English word "sound," and includes articulate as well as musical tones. In other words, because articulate speech is *included* under the expression "tone," therefore articulate speech as well as musical tones were certainly meant; an argument which fails to convince us. That articulate speech cannot be reproduced by mere interruptions is, we believe, held even by Prof. Thompson, yet on page 57 we have the following words of Reis himself, "the needle reproduces the *tone* which was imparted by the *interruption* apparatus."

That Reis's apparatus did transmit articulate speech may be admitted, but that it did so as a result of the inventor's endeavour to produce an undulatory current and not an intermittent one we cannot admit, and we must repeat that the evidence is utterly insufficient to prove. Prof. Thompson, after characterising the common statements, that the actual transmission of speech of the Reis instrument was an accidental circumstance as mere clap-trap, recommends a mute appeal to the original writings of Reis and his contemporaries, and to the tangible witness of inexorable scientific facts. Prof. Thompson's recommendation may be safely acted upon, and it will confirm the idea that the transmitter was intended to act as a "make and break," and also that the circumstance of clear articulate speech having been heard at times by means of the apparatus was due to a course which the inventor did his best to avoid but which, fortunately for himself, he did not succeed in avoiding; however, "Honour to whom honour is due," and although we disagree *in toto* with Prof. Thompson as regards the main point at issue, we quite think that a greater recognition of the value of Philipp Reis's labours than has hitherto been accorded him is his due, and this Prof. Thompson's work will accomplish.

ELECTRICAL TRACTION.

SOME weeks since experiments were made in Paris by the French Electrical Power Storage Company on tram-car propulsion by means of electricity.

M. Philippart, whose name is very familiar to the readers of the ELECTRICAL REVIEW, and who, we believe, conducted the experiments referred to, has addressed a communication on this topic to a member of the directing committee of the Compagnie Générale des Omnibus, the subject of which is published in our French contemporary *L'Electricité*. M. Philippart says in his letter, dated Paris, July 8th, 1883:—

"You have congratulated me on the success of our traction experiments on tram-cars driven by electricity; and you have stated that this success seemed complete. But, like every one else, you have asked me the question, "What is the cost?" With regard to this question I give you the figures which will allow you to form your own opinion.

"We performed the journey from the Place de la Nation to the Place de l'Etoile by the outer boulevards for the fifth time last Thursday. Although the car was loaded (its total weight, everything included, was at least ten tons), although the grooves of the rails were filled with dust collected by the sweepers, and notwithstanding slopes from two to five centimetres, the journey was completed in one hour. The indications of the galvanometers and voltmeters showed that we expended during the whole of the journey, all allowances made, a force equal to 10 electrical H.P. (1 electrical H.P. = 750 volt-ampères). We therefore utilised, during one hour, an electrical H.P. per ton, to make a journey of 11 kilometres with a machine which rendered a co-efficient of 70 per cent. of useful work.

"By means of these indications any engineer can calculate at what point the conditions were unfavourable, nevertheless, it is upon an effort equal to an electrical H.P. per ton drawn that we shall establish our calculations. For everything I shall take the actual maxima, leaving to the future all improvements and reductions. We shall estimate the loss of electricity in charging and discharging the accumulators at 25 per cent., although Profs. Thompson, Ayrton, and Morton have only proved 20, 18, and even 10 per cent. loss.

"Lastly we shall reckon that a ton of accumulators can give only 30 electrical H.P., whilst our experiments gave 40.

"Upon all these premises there can be no dispute, their verification being possible at any time in our workshops.

"It only remains, therefore, to establish the cost price of the accumulators, the dynamo-machines, their maintenance and their durability.

"The dynamo will cost 2,500 fr. for an effective power of 12 to 15 H.P. Its maintenance consists in the replacing of the brushes and the wearing of the bearings. The principal expense, therefore, is the price and maintenance of the accumulators; and this is, without doubt, the principal object of your inquiry.

"Here again I shall allow a good margin. Besides the price of the royalty and of the box which contains the lead, this metal, which constitutes the accumulator, costs, manufactured in plates suitable for the requirements of traction, 600 francs per ton (we have an agreement at this price). The worn out plates are replaced at 250 francs per ton.

"You know as I do that, in an accumulator, the duration of the negative plate is almost unlimited; the positive plate alone, after a duration of 4 to 12 months, becomes unfit for use, because all the lead is peroxidised and is no longer conductive. Without doubt, sooner or later, a remedy will be found for this defect; meanwhile let us put things at the worst and say that three times per year, or every four months, we shall change the positive plates, that is to say, half the weight of the accumulators.

"We have, therefore, to reckon 1½ tons per ton and per year, at 600 francs per ton, that makes 900 francs, from which we have to deduct 1½ tons at 250 francs = 375 francs. This leaves an annual expenditure of 525 francs per ton, let us say 600 francs with the manipulation.

"You have now all the figures and all the elements necessary for ascertaining the cost price per day and per car. Allow me to assist you by explaining how I think that our processes ought to be applied to obtain the best possible results.

"And first of all I shall take care not to touch your cars at all in placing our machines and our accumulators, as we have done on the experimental car. I shall replace the horses by a truck 2 metres wide by 4 metres long, occupying just the same space as the horses; above the wheels a space 75 centimetres high will contain the machine and the accumulators, and upon the whole will be fixed an elegant covered compartment to accommodate 12 passengers paying 50 centimes for all distances. This compartment will certainly bring in 50 francs per day.

"Let us see now what we shall have to expend in capital first of all, then the cost of working and dividends.

"For each car in use we shall require two trucks, each capable of working for 5 hours, or of travelling 60 kilometres without being recharged.

"Your own cars for 50 passengers, fully loaded, weigh 7 tons, the trucks will weigh 8 tons.

"Axles and framework	... ...	2½ tons.
Accumulators and machines	... ...	4½ „
Passengers	... ...	1 „
	Total ...	8 „

Of which 3 tons is accumulators.

"As we have 15 tons to draw, we require a force of 15 electrical H.P.; or, for 5 hours, 75 H.P.-hour. We have seen above that one ton of accumulators would render 30 H.P.-hour; with 3 tons we shall have, therefore, 90 H.P.-hour, or a reserve of 15 H.P.-hour. You see that I give you the promised good measure.

"Each truck will cost 10,000 francs, all complete; it is therefore an expenditure of 20,000 francs per car in use, that is to say, exactly what your horses and harness cost at present. There will remain this advantage, half the depôts at least may be suppressed, less the expenditure for the installation of fixed machines for charging the accumulators, which will not exceed 5,000 francs per car in use.

"We now come to the cost of working, which we divide into 3 portions:—

"1st.—The motive-power.

"2nd.—The interest and paying off the capital employed.

"3rd.—The maintenance of the accumulators.

"For each journey of the car, we require 150 electrical H.P.-hour, or 200 H.P.-hour, in consequence of the loss of 25 per cent. allowed above.

"I need not point out to you that for carbon, oil, manipulation, maintenance, and paying off an H.P.-hour, produced on a large scale, does not cost 5 centimes.

"At this price the traction will cost 10 francs per day. I add 5 francs for oil, grease, and maintenance of the dynamo and trucks; this is, in all, 15 for the motive-power.

"We have then the interest and paying off of a capital of 25,000 francs per car in use: let us reckon 12 per cent. or 3,000 francs per year and per car.

"Lastly, six tons of accumulators at 600 francs for the maintenance, that makes 3,600 francs per year and per car. We will add to these two last figures 700 francs per year and per car for general expenses, that will make, in round numbers, 20 francs per day.

"You see that although I have raised my figures, I have only 35 francs per day; and, as my conductor will bring me back at least 50 francs, I can still take 15 francs per day and draw your car for nothing.

"But this is not the only benefit which I bring you.

"The extra 30 kilometres travelled!

"The possibility of increasing, at certain hours and on certain days, the number of cars in use.

"And the possible creation of special cars making during the first and last hours of the day, a service at reduced prices for carrying workmen.

"I hope I have answered your question in a satisfactory manner. I published this without fear of the criticism of engineers, electricians, and any competent persons. I am persuaded that all will say that my figures are exaggerated and that they leave for the future a vast field for improvement of every kind. We shall speak later on of the traction of road-cars."

NOTES.

Electric Lighting.—The Clerkenwell Vestry has been presented with a memorial, signed by 152 inhabitants of Pentonville Road, praying for the continuance of the electric light in Pentonville Road, and alleging that it has been a great benefit not only to the inhabitants, but to the safety of traffic and to the moral tone of the neighbourhood. The matter has been referred to the consideration of a committee. Cannot something be arranged between the Vestry and the Maxim-Weston Electric Light Company for the continuance of the system?

Messrs. Holmes and Vaudrey, on behalf of the Liverpool Electric Supply Company, have fitted up a restaurant in Dale Street, Liverpool, with Woodhouse and Rawson's incandescence electric lamps. A gas-engine is employed to drive the dynamo, and, as a measure of safety, secondary batteries form part of the installation.

It has been officially made known that the Board of Trade, having considered Major Marindin's report upon his examination in the Newington Vestry Electric Lighting Scheme at the Vestry Hall, has decided not to sanction the same. We have commented at some length in our other columns on this matter.

The new yacht *Leisure Hour*, now being built for J. J. Michael, Esq., of Bayswater, is to be lighted by the Universal lamps, the system proposed to be adopted is Captain A. de Khotinsky's storage batteries, the charging current being supplied by the Woodward thermopile generators in order to utilise the waste steam of the engine. As this combined system is entirely new, the results will be looked forward to with interest. The installation is to be carried out by Messrs. Shippey Bros., 13, King Street, Cheapside, E.C., to whom we are indebted for the above information.

In the House of Commons on Wednesday on the order for the consideration of the Electric Lighting Provisional Order (No. 8) Bill. Mr. W. H. Smith said that he understood some alteration had been introduced into the Bill by the Select Committee. The Strand Board objected to the inclusion of their district within the Order which was made last May and passed by the Committee. He hoped that the President of the Board of Trade would consent to the omission of the Strand from the present Order. Sir G. Campbell said that the local authorities of Kensington had not consented to the Provisional Order and hoped that it would be postponed for three months. Mr. Chamberlain was surprised at the opposition of the hon. member for Kirkcaldy. The postponement of the Order for three months meant its postponement to another Session. The Board of Trade had carefully examined the whole question, and the Order had been assented to by all the parties concerned. With respect to the Strand, proposals had been made by the Jablochkoff Company, but the Committee did not think they were seriously intended. Accordingly, after hearing representations from private consumers, the Committee passed an order in favour of the Swan Company, subject to certain limitations. He hoped the House would not put any further obstacles in the way of the order. Sir A. Gordon, speaking as a Kensington vestryman, said that the hon. member for Kirkcaldy did not represent the views of the Kensington authorities. Mr. Yorke hoped the President of the Board of Trade would not persist with the measure. The Bill was then considered.

Electric Lighting Provisional Order Bills.—The Hybrid Committee of the House of Commons appointed to consider the merits of these Bills has decided to pass the Edison Order for the lighting of the parish of St. James, Westminster, on condition that the Order is extended so as to include the lighting of the whole of the parishes of St. Martin-in-the-Fields and St. Paul's, Covent Garden, and that the maximum price for the Edison be reduced to 8d. per unit, the same as the Swan. The Jablochkoff Company was excluded from the portion of the Strand district which they asked a licence for. The Committee has also passed the Swan Order for the lighting of the Strand district, subject to the alterations made in the Edison Order. With respect to the Victoria District Order, this also has been passed, on condition that the Swan Company shall strike out everything relating to the district of the Westminster Board of Works.

The Vienna International Electrical Exhibition.—The Managing Committee of the Vienna International Electric Exhibition, which recently announced that in consequence of the delay in the arrival of exhibits the opening of the Exhibition, originally arranged for August 1, would have to be postponed, has now fixed the ceremony for August 16. It may be of interest to our readers to know that the British Commissioners have appointed Mr. F. H. Webb (Secretary of the Society of Telegraph Engineers and of Electricians) as their Secretary in London, and Lieutenant Ralph W. Anstruther, R.E., as their Secretary in Vienna.

New China Telegraph Stations.—The Eastern Telegraph Company (Limited) notifies the opening for traffic of new stations in China at Nanching, Hangchow, Ningpo, and Shanking, the rate from the United Kingdom being 9s. 7d. per word.

Telegraphic Communication with Lightships.—The arrangements for obtaining telegraphic communication with lightships around our coasts are so far advanced that the Trinity Board hope to have the wires working between the Sunk Lightship and the shore in two months' time. The experiment will be continued for at least twelve months.

Telegrams from the Country.—In the House of Commons on Thursday week Mr. Richard Paget asked the Postmaster-General if he would be good enough to consider the advisibility of establishing a cheaper rate for telegrams sent from the country to London (or any other populous place having two or more postal deliveries during the day), subject to the condition that such telegrams shall not be specially delivered, but shall be sent to their addresses by the earliest available postal delivery of letters? Mr. Fawcett said that very careful consideration had been given to the proposal contained in the question. It had been ascertained that the saving of delivering telegrams in towns by post instead of by messenger would not be more than a penny a message. Under these circumstances he did not think it would be desirable to depart from the principle, which, in his opinion, was very important, of maintaining a uniform charge.

The Late Mrs. Chaplin Ayrton.—We regret to see the announcement of the death, at the early age of 37 years, of Mrs. Chaplin Ayrton, the wife of Prof. W. E. Ayrton.

The Electrical Tramway at Caen.—At the time of the opening of the Exposition de Caen, towards the end of June, the first train on the electrical railway established by M. C. Dupuy left the station at the Rue du Pont-Saint-Jacques in presence of the official *cortége* which was present at the inauguration. This train, we read in *La Nature*, traversed the distance from the station to the Exposition (about 450 mètres) in 42 seconds. This is a relatively high speed, and it could be considerably exceeded but for the danger of accidents through the traffic in the streets traversed by the tramway. However, it is worthy of notice that there is no danger of these accidents at the normal speed, by reason of the facility with which the conductor can stop the machine, as has been shown by the different trials which have been made up till now. Starting, alteration of speed, and almost instantaneous stoppage are all produced with remarkable readiness and by the manipulation of a single lever. The electrical locomotive consists of a sort of rolling truck containing a dynamo-electric machine, actuating one of the axles of the vehicle by a chain and suitably-arranged gearing. The motive-power is furnished by 84 accumulators. These accumulators are capable of giving a very energetic current for several hours. For charging they are connected with any suitable source of electricity, such as the Edison machine placed in the interior of the Exposition and intended for lighting the building.

Insulation of Electrical Conductors.—The electrical railway shown in action recently at the Wimbledon meeting of the Rifle Association had the current supplied through two flat copper bands about an inch broad, each laid at the bottom of a groove in long wood bearers stretched midway between the lines of rails and supported on square wood blocks saturated with pitch. A daily paper, in a note descriptive of the permanent way, says "the insulation appeared to be perfect, for when tested by a galvanometer and a battery of 5 cells not the slightest deflection of the needle takes place." This is the convincing kind of test which used to be applied to submarine cables in the earliest days of their manufacture.

"Its very failings lean to virtue's side."—The poet has imparted to us the useful piece of information that "In the spring a young man's fancy lightly turned to thoughts of love;" but it was reserved to Mr. Thomas Whimster, of Perth, to enlighten the North British Association of Gas Managers, which recently assembled at Stirling, that in the summer the gasman's fancy fondly dwells on subjects *light*. After a brief review of the progress made during the past thirty years in the manufacture and distribution of gas, Mr. Whimster said it would seem like affectation to omit noticing the electric light in an address to an association such as this. Indeed, the address would be like the play of "Hamlet" without the Ghost. The Herculean or Crœsus-like efforts to perfect and introduce this light as a rival to or substitute for gas have not yet been successful, and I dare say that, as a rule, gas managers think that, from present appearances, there is no very reasonable prospect of its success in the near future. There is no doubt that a place for it, as an illuminant in exceptional industrial operations and amongst scientific appliances, will be found; but in its competition with gas it has beyond all question signally failed. The work done by the committee of the "Gas Institute," in connection with the International Electric and Gas Exhibition, held at the Crystal Palace in the spring of this year, settled the point and restored a confidence in gas property which it will not be easy again to disturb; and there could be no better proof that the institute had established itself in the public estimation as a competent and trustworthy body, and the result of the committee's labours unquestionably justified the confidence placed in it. The complete control established in the use of gas, its cheapness, and its assured progress towards reduced cost, its safety, its constant supply and absolute reliability—we never think of having candles in store against a possible failure of gas, because it never fails—will insure its place as the friend of the rich man as well as the poor. As Burns said of his friend, its "very failings lean to virtue's side."

Mr. D. B. Esplin, Forfar, read some "Practical Notes on Interior Electric Lighting," in which he narrated the experience of a firm in Forfar who had introduced the electric light. The arrangement with the local Electric Lighting Company was that the cost should not be greater than the amount hitherto paid for gas. The light was placed in the finishing shed, and six arc lamps were employed, and without taking into account the engine-power, which was supplied by the machine at the works, the cost for a year, including £25 5s. for gas on the occurrence of breakdowns, was £128 as compared with £75 formerly paid for gas. Next year the tender for lighting the same area was £65, without any allowance for contingencies; but allowing £10, Mr. Esplin came to the conclusion that, without discussing the probability of the Electric Company making profit, the cost of lighting by both systems was practically the same, if the motive-power was not taken into account. A tender was also made to light the whole of the weaving sheds as well as the finishing department. The installation was to cost £791 12s., this to include the purchase of the necessary machines and sixteen lamps. The carbons alone for these lamps would cost annually £216 6s., and with 10 per cent. added for wear and tear, the cost would be £295 as compared with £287 for gas.

At the conclusion of the reading of the paper, Mr. Smith, of Aberdeen, narrated the experience of his Corporation in experimenting with the electric light, and said that from all he had seen, and from the most careful calculations he had been able to make, he had seen no reason to alter the opinion he had formed in 1879, that electricity could not be produced except at a cost three times greater than gas. In Aberdeen the cost of electric lighting had been six and a-half times more than gas. It was only fair, however, for him to say that exception had been taken by the electrician of the Brush Electric Company to the above statement. Giving effect to his objections, however, the cost was still about four times more than gas. Mr. Smith also complained bitterly of the way in which the press had dealt with this question, and said that the press was to blame for misleading the public on the merits of the two systems of light. Several members also took exception to Mr. Esplin's paper, on the ground that in estimating the cost he had not taken into account the motive-power, the fuel necessary to keep the engine in motion, and the attendance. Others again, such as Mr. Adamson, of Airdrie, considered that electric lighting was only in its infancy, and that the day might soon come when the light would take its place as an illuminant.

The Distribution of Electricity.—M. Gaulard writes to us on this subject to the following effect:—"You have had in hand, although it has not been published, the project for the electric lighting of the Suez Canal presented by the National Company for Distribution of Electricity by Secondary Generators, and in your number of the 28th of July, you give your opinion upon this project. I think that it would have been more useful for your readers to discuss the project technically, rather than to limit yourself to treating its author so lightly." As we were not favoured by the author with a copy of the pamphlet alluded to in our last issue, we made our notes from one brought to our notice privately. Our opinion on the matter is of a contrary nature to that of M. Gaulard, for we should not have been justified in inflicting upon our readers the task of wading through the "project," and we therefore condensed it and expressed our views on the subject in a way which appears to have been unpalatable to the author. If M. Gaulard feels so disposed he is at liberty to ventilate his project in our columns, and our readers will doubtless discuss the question.

Cable Duplication.—The duplication of the Great Northern Telegraph Company's cable from Wladiwostock to Nagasaki has been completed, and the new cable was opened for traffic on the 27th ult. The duplication of the Nagasaki-Shanghai cable will be proceeded with forthwith.

Death of an English Electrician in India.—It is with regret that we notice the death of Mr. Floyd, the telegraph superintendent of the Indian G. I. P. Railway, which occurred, says the *Bombay Gazette*, on the 1st July. He was a very talented man in his profession, and since his arrival in India had, we believe, says our contemporary, effected great improvement in the working and management of the G. I. P. system of telegraphs. Mr. Floyd was a member of the Society of Telegraph Engineers, and joined the G. I. P. Railway on the recommendation of the highest authorities on telegraphy in England. His experience was very extensive, and amongst other improvements he had patented an invention, described in the ELECTRICAL REVIEW for September 30th, 1882, for communication between passengers, guards, and drivers, which is now in use on the local trains, and working, we understand, very efficiently. His loss will not only be felt by the railway company, but by the profession generally.

Winding-up Petitions.—A petition for winding-up the "Pilsen"-Joel and General Electric Light Company

(Limited) is to be heard to-day before Mr. Justice Pearson. A petition for winding-up the Mediterranean Extension Telegraph Company (Limited) comes up for hearing before Vice-Chancellor Bacon to-day.

The Electric Manufacturing Company of Scotland.—The directors of the Electric Carbon Storage Manufacturing Company of Scotland have called a meeting of the shareholders for Monday, August 6th, to consider the advisability of voluntarily winding-up the company. Mr. Hope, senior, of the firm of Messrs. William Hope & Sons, Leith, was managing director and one of the largest shareholders of the company, and it is stated that the action taken by the directors is in consequence of the failure of Mr. Hope's firm. Should the shareholders approve of the proposal of the directors, it is proposed to start a new company for the purpose of carrying out the contracts of the present company, which it is stated, will take a year for execution. These include the lighting of Leeds Corporation Buildings at a cost of nearly £10,000, and the introduction of the electric light into the Lyceum and Royal Theatres, Edinburgh.

An Ironclad Fired by the Electric Light.—Reuter's telegram from Gibraltar, dated July 31st, says: Lieutenant-General Sir John Adye, the governor, dined yesterday evening with the Italian Admiral on board the ironclad *Dandolo*. During the evening the electric light wire fused and set fire to a bulkhead. The flames were, however, very quickly extinguished and no damage was done.

The United Telephone Company v. The London and Globe Telephone Company.—A motion was set down for hearing on Thursday, before Vice-Chancellor Bacon, in the Chancery Division of the High Court of Justice, but it was then explained by counsel that the parties had arranged that the case should stand over until after the long vacation, and this his Lordship agreed to.

OFFICIAL RETURNS OF ELECTRIC COMPANIES.

Manchester and District Edison Electric Light Company (Limited).—The return of this company, made up to the 17th ult., was filed on the 25th ult. The nominal capital is £600,000, divided into 50,000 A and 10,000 B shares, of £10 each. 20,000 A and 10,000 B shares have been taken up, and a call of £2 per share has been made upon the former and the full amount has been called upon the latter. The calls paid amount to £140,000. Registered office, 19, Victoria Buildings, Manchester.

Telephone Company of Austria (Limited).—An agreement dated 20th ult. has been entered into by this company with the Consolidated Telephone Construction and Maintenance Company (Limited) and the Edison Gower-Bell Telephone Company of Europe, for the purchase of concessions granted for the erection and working of telephonic communications in the towns of Prague, Graz, Trieste, Lemberg, Cracow, Pilsen, Reichenburg, Ozemowitz, and Bielitz Biala in the Austrian empire. The purchase consideration is £30,000, in fully paid-up shares.

Charakite Company (Limited).—The return of this company, made up to the 3rd of May, was filed on the 12th ult. The nominal capital is £8,000 in £5 shares. 321 shares have been taken up, and upon 165 of these the full amount has been called, but nothing upon the remaining 156 shares. The calls paid amount to £825.

British Insulite Company (Limited).—The annual return of this company was made up and filed on the 20th February. The nominal capital is £25,000, divided into 24,900 A shares of £10 each, and 1,000 B shares of £1 each. 11,882 A and the whole of the B shares have been taken up, and upon the former a call of £5 has been made, the latter being considered as paid up. The calls paid on the A shares amount to £59,410. Registered office, 20, Coleman Street.

General Electric Lighting Company (Limited).—At an extraordinary general meeting of the above company, held at 99, Gresham Street, on the 9th ult., the following resolution was passed, viz., "That it being considered unadvisable by the company to continue its business, it is decided to wind up the same voluntarily, and that Mr. Charles Harvey, of 99, Gresham Street, London, E.C., having agreed to act without remuneration, be appointed liquidator of the company." The resolution was confirmed on the 23rd ult., and duly filed on the 30th ult.

CITY NOTES, REPORTS, MEETINGS, &c.

Submarine Telegraph Company between Great Britain and the Continent of Europe (Limited).

THE half-yearly meeting was held at the offices of the company, 2, Throgmorton Avenue, London Wall, E.C., on Thursday, Sir Julian Goldsmid, Bart., the chairman of the company, presiding.

The Secretary, Mr. S. M. Clare, having read the notice convening the meeting,

The Chairman affixed the seal to the register of shareholders.

The report of the directors, which was taken as read, said: The accounts for the six months ending 30th June, 1883, show that the receipts amounted to £64,332 2s. 11d., which is less by £6,009 11s. 3d. than the amount received in the corresponding period of the year 1882. But the accounts for the six months ending June, 1882, included a sum of £2,477, received from the Post-office in respect to the settlement of various outstanding accounts; and therefore deducting this sum the reduction in the ordinary receipts for the half-year is £3,532 11s. 3d. This falling off in the ordinary receipts is partly attributable to the general depression in business, partly to the long time during which the two cables to Holland were simultaneously interrupted, and partly owing to the reduced length of the messages. The accounts also show that a sum of £5,319 5s. 9½d. has been expended on repairs to cables, which exceeds the expenditure incurred under this head in the six months ending June, 1882, by £1,009 16s. 9½d. In accordance with the terms of the resolution passed at the ordinary half-yearly meeting of the proprietors in February last, 15 per cent. in lieu of 10 per cent. of the gross receipts has been added to the reserve fund. The balance of net revenue enables the directors to recommend a dividend at the rate of 14 per cent. per annum, and carry over to the next account £107 11s. 11d. Since the last general meeting two vacancies have occurred in the direction, one by the resignation of Sir Arthur Otway, Bart., M.P., and the other by the lamented death of Sir James Robert Carmichael, Bart. The late chairman was one of the pioneers of submarine telegraphy, and had constantly devoted his time, energy, and ability to the service of the company ever since its formation. He invariably displayed to all with whom he came in contact the greatest courtesy and kindness, and his premature death is much to be deplored. The cables to France and Belgium have been entirely free from interruptions during the half-year and are all in good order. The increase in the item of cable repairs is owing to the heavy outlay which has been necessitated by the condition of the Dutch cables belonging to the Government, but worked by this company.

The Chairman, in moving the adoption of the report and accounts, said he had a good many observations with which, on behalf of the board, he considered it his duty to trouble the shareholders. In the first place he desired to express to them, and he might say for them, the regret which they all felt at the loss they had sustained in the death of the late Sir James Carmichael (hear, hear). He needed not tell them, because most of them had often attended meetings of that company and knew of his courtesy and kindness, how he was always ready to receive every shareholder, how very ably he discharged his duty as chairman, and what interest he took from the first in the success of the Submarine Telegraph Company (hear, hear). He was consequently sure he was expressing their feelings, as well as those of the board, when he said they all entertained the deepest regret for his loss—a regret which was unmixed altogether by any other consideration (hear, hear). They trusted that under the severe blow which Lady Carmichael had received she might bear up as they desired to see her bear up; and she had this consolation, that in her son—Sir James Carmichael—she had a most worthy representative of his late departed father (hear, hear). He would now proceed to call their attention to the report, and he regretted that on the first occasion on which he had to address them he had to call their attention to a very marked diminution of income. That, he might say, was practically, entirely, and absolutely beyond the control of the directors. They had nothing to do with the amount of receipts; all they had to do with was with the amount of the expenditure. It to a certain extent might be and was under their control, but the amount of receipts was not in any way to be controlled by them. With regard to that there was a very curious circumstance to observe. They had pointed out three reasons for the reduction in the receipts, and those three reasons had all had their share in it, but the reason which was put last, the reduced length of the messages, was to his mind one of the greatest importance (hear, hear). Upon that point he thought it was right that he should inform the shareholders the exact state of the case. In the six months ending June, 1882, they transmitted 1,312,240 messages, containing 17,427,814 words. In the corresponding period just closed, namely, the six months ending June, 1883, they had transmitted 1,337,009 messages, containing 16,925,163 words only. Therefore they had transmitted 24,766 more messages, but they had at the same time sent 502,651 less in the number of words, and therefore the average length of the messages was so much less. The average length of the messages for the half-year ending June, 1882, was 13$\frac{1}{4}$, whereas the average length for the half-year ending June, 1883, was 12$\frac{2}{3}$ words, and that simple fact accounted to a great extent for the large reduction of receipts. In regard to that matter he did not think the shareholders could in any way find fault with the board. The other reasons mentioned for the reduction he thought almost spoke for themselves. There had been a small increase in the number of messages, but he thought hardly an average increase, and there had also been, as stated in the report, a very long period during which the two Government cables to Holland were simultaneously interrupted. They had to see to those cables and keep them in repair. They had been in very bad order. They run in a line somewhat dangerous to the life of a cable, and had involved very heavy repairs, which had cost them a larger sum of money than usual, and on account of the delay in these repairs caused by the weather, there was a diminution in the receipts. Then there was the fact which also contributed to a diminution in the dividend, that they had added a larger sum to the reserve fund. As one or two proprietors had addressed him in writing and verbally on the subject of the reserve fund, he thought it was as well that he should explain the exact position of the matter. In June, 1863, as many of them would remember, 10 per cent. of the gross receipts were added to the reserve fund for the first time, and that proportion of the receipts was added every half-year until 1873, when, at a meeting held on the 25th February of that year, it was resolved that in lieu of adding 10 per cent. 5 per cent. only should be added. Individually he disagreed with and disapproved of that resolution. As probably many of them would remember, there was considerable agitation, especially on the part of their northern shareholders, with regard to adding large sums to the reserve fund, and the late Sir James Carmichael was of opinion that the board ought not to guide or influence the shareholders in the matter, but that the question should be left to the shareholders entirely. He (Sir Julian) thought the board should guide the shareholders, but being in a minority he could not go against the opinion of the majority. That proportion of 5 per cent. was continued until the meeting held on the 3rd August, 1880, when sounder views prevailed, and it was resolved that in lieu of adding 5 per cent. per annum, the sum of 10 per cent. per annum on the gross receipts should be added in the future. Matters so remained until the meeting on the 21st February last. He was not present at that meeting, he was then in India, and therefore it was impossible for him to give an opinion. A resolution was come to at that meeting to which he desired to call their attention. It was as follows: "That notice be given at the next ordinary half-yearly meeting of the proprietors that from the 1st January, 1883, 15 per cent. of the gross receipts will be added to the reserve fund instead of 10 per cent. authorised by the resolution of the proprietors at the meeting of the 3rd August, 1880." He was, as he had said, opposed to the reduction from 10 to 5 per cent. taking place in 1873, and he did not think he should have advocated an increase from 10 per cent. to 15 per cent. without large consideration and careful examination (hear, hear), but the proprietors came to that resolution, and that resolution was in force that day; and consequently the accounts could only be prepared, and the dividend proposed, subject to that resolution; and therefore, as the proprietors had no power to increase the dividend, they were bound either to refuse to have a dividend or to accept a dividend at the rate of 14 per cent., to which it was reduced partly by the reduction of traffic and partly by the addition to the reserve fund. They would ask him what was his opinion as to the future arrangements for the reserve fund. Should he advise them to continue to add 15 per cent. or to return to 10 per cent., or should he adopt the principle which he knew the late Sir James Carmichael adopted of leaving it absolutely to them? He for one thought, and the majority of his colleagues agreed with him, that the directors ought really to advise the shareholders in this matter (hear, hear). They naturally knew more about the position of the company than the shareholders could possibly know, in consequence of their attention as directors to the company's affairs, and whatever advice they gave would be given with the best desire to serve the interests of the company. As he had said, he had not been in favour of increasing the percentage to the reserve fund last winter, but he did not recommend them at the present moment to return from the 15 to the 10 per cent. He did not think it was a good thing to be always changing and trotting about without some satisfactory reason. He had gone into the figures, and the increase from 10 to 15 per cent. made a difference in the dividend on that occasion of about $\frac{3}{4}$ths per cent., or $1\frac{1}{2}$ per cent. per annum; that was to say, if they had not increased the percentage by 5 per cent. they could have been able to declare a dividend of $15\frac{1}{2}$ per cent. per annum instead of 14. If they were not able to make any arrangements with regard to a future life, and he could assure them that the board would do all in their power to see what could be done in the matter, he did not think it would be unwise to add the 15 per cent.; but if they were able to make the desired arrangements he thought they should have a good ground for returning to 10 per cent., and the advice he should now venture to give was that they should leave matters as they were for the present. He ought, perhaps, to say with regard to the Dutch cables that they had done their best to put them in working order, but they were not in a satisfactory condition. They had called the attention of the Government authorities to the condition of these cables, and they and the company conjointly were considering what could be done in the matter. He had now to refer to the vacancies on the board. When Sir Arthur Otway, who for many years had been one of the most able and energetic directors of the company, was appointed to the onerous and responsible position of chairman of committees in the House of Commons, he thought it right to resign his position as a director of the company. It appeared to him (the Chairman) that that was perfectly unnecessary, and the directors thought and hoped that they might yet induce Sir Arthur to return to his seat. That being so it was well to keep a vacancy on the board at present; the reasons for their so doing would be apparent to all. Mr. E. Chandos Leigh, Q.C., was the only person who had offered himself for the other vacancy. He was a very old shareholder, and the board had pleasure in approving of his candidature. He concluded by moving the adoption of the report and accounts.

Mr. Capper, in seconding the motion, endorsed the remarks of the chairman in regard to the percentage of the gross profits which should be added to the reserve fund.

Mr. Rostron deemed it advisable that they should not interfere with the substantial strength of the fund.

Sir Charles Bright did not see the utility of their increasing the reserve fund by that 5 per cent., but considering he was one of those who believed it better for the shareholders to be guided by the directors, he supported the motion.

In answer to questions,

The Chairman said he did not think it was the business of the directors to trouble themselves with the marketable value of the stock, and he could not say how it would be affected by the increased percentage on the gross profit that was being added to the reserve fund. The directors thought five days sufficient time for the shareholders to examine the report and accounts before a meeting, but if the directors could possibly give them longer time they should do so. It was in the power of the shareholders to elect two of their number to fill the vacancies on the board. He had given his reasons for asking that one of the vacancies should not now be filled.

The report and accounts were then unanimously adopted.

The Chairman moved: "That in accordance with the recommendation of the board of directors, a dividend for the half-year ending 30th June, 1883, at the rate of 14 per cent. per annum, less income-tax upon the capital of the company, be declared, and that it become payable on and after the 1st September next."

Mr. Ashley Ponsonby seconded, and the motion was agreed to.

Mr. R. Bourke, M.P., and Mr. H. R. Brand, M.P., the retiring directors, were re-elected, and Mr. Chandos Leigh, Q.C., was elected to one of the vacant seats on the board.

The retiring auditors, Mr. G. C. Capper, Mr. W. R. Cole, and Mr. T. Dakin were re-elected.

A vote of thanks to the chairman and directors closed the meeting.

The Direct Spanish Telegraph Company (Limited).

An extraordinary general meeting was held at the Cannon Street Hotel, on Friday of last week, Mr. Neil Bannatyne, the chairman of the company, presiding.

The Manager, Mr. Chas. Gerhardi, having read the notice convening the meeting,

The Chairman said the shareholders, from the notice they had received, were aware for what purpose the meeting had been called, and he should therefore at the outset move the first resolution, which was as follows:—"That the directors be and are hereby authorised to establish, maintain and work a submarine cable in duplication of the company's cable between England and Spain, and to raise the capital necessary for that purpose by the exercise of the borrowing powers vested in the directors by the regulations of the company." He had not much to say on the resolution, but he should make one or two explanatory remarks. He did not know whether any of the shareholders now in attendance were present on the occasion of the last meeting when Mr. Etlinger, who occupied the chair, went into a minute and detailed report upon the position of the company, and upon the misfortunes with which they had been met in consequence of the repeated breakages of the cable; but any of the shareholders who were present then would not be surprised that the directors had now called a meeting for the purpose of passing that resolution. The subject was one which the directors had very frequently and very deliberately considered, and it had given them a good deal of anxiety as to what steps they should take and when they should take them. The money spent on the repairs of the cable since it began to work ten and a half years ago amounted to close on £25,000, which in round numbers was about £2,500 a-year. That, of course, was not the only loss the company had sustained by these breakages. There had been the interruption to their traffic and the loss of it for some period even after the cable had been repaired, because it was not very easy to get their traffic back again after the cable had been in disuse for six weeks or two months. No doubt since they had entered into a working arrangement with the Eastern Telegraph Company they had not suffered to the same extent as they otherwise would have done; but even with the advantages of that working agreement they could not help losing a certain amount of traffic. While their cable was interrupted they recommended their customers to send their messages by the Eastern Company's system, but of course that was not always done, and he should say, taking the actual outlay for repairs and their loss of traffic, directly and indirectly, that he should not be over the mark in estimating their loss, in addition to the £2,500 he had mentioned, as probably £1,500 or £2,000 a-year. In fact he should say that would be about the minimum loss per annum, therefore it became their duty seriously to consider whether it would not be for the advantage of the shareholders, both preference and ordinary, and especially ordinary, that they should duplicate the cable. They had given great consideration as to how they could accomplish that and what would be the result, and if they raised the necessary money to lay the duplicate cable, which they did not anticipate any difficulty in doing, and if they carried the thing out, they saw their way, he thought, to be able, without looking to a great increase of traffic—they expected to have an increase of traffic when trade was better in Spain—to pay the interest on the money they raised, to pay all their working expenses and 10 per cent. preference dividend, and to have left an amount sufficient to give a fair dividend to the ordinary shareholders as well as to put a moderate sum every year to the reserve fund. It was the unanimous opinion of the board and of the large and influential shareholders, who had entered the company since their last meeting and who held a preponderance of the ordinary capital of the company, that they should at as early an opportunity as convenient make the necessary arrangements for having a new cable made and laid. The board were unanimously of that opinion, as it was of the first consequence to the company that it should be done.

Mr. Etlinger seconded the resolution.

Mr. A. H. Baker: How much do you propose borrowing?

The Chairman replied that the directors could not say the exact amount for which they could make a contract for the cable, but they might say from £60,000 to £70,000. The interest would be something about £4,000 per annum, which he was quite certain was a decidedly smaller sum than they had lost per annum since the cable began work. His own opinion was, when they had a duplicate cable once laid, that the Direct Spanish Telegraph Company would hold a very strong and good position. For the year ending June last the repairs of the cable had actually cost them £9,000. Since the last repairs were completed the cable was working very satisfactorily and its electrical condition, according to the latest advices, was very good; as to its mechanical condition they could not say. They could not lay the new cable this year on account of the weather in the Bay of Biscay in September and October being so rough. They should like to be able to take advantage of the first fine weather in spring and until then they could only hope the present cable would work satisfactorily, but should there be another break, they expected to have it repaired on much cheaper terms than their former repairs had been done upon.

The resolution was then unanimously adopted.

The Chairman said the next resolution he had to propose was that Sir James Anderson and Mr. John Denison Pender be elected directors of the company in addition to the present directors. He had already said that since their last meeting a very large number of their ordinary shares had passed into the hands of new holders. The gentlemen he had named were only desirous of promoting the prosperity of the company. They were largely interested in the Eastern Company, with which they knew they had a working arrangement, and thought it would be of great importance to this company that they should draw the bonds which united them with the Eastern Company closer, and the Eastern Company might be of great service to this company. The Eastern Company had a very large extent of cable under their control and management, and they had men of very considerable experience in the management of submarine cables, and these gentlemen had a strong opinion that it would be for the benefit of the company that the board should be strengthened by the introduction of one or two gentlemen more or less connected with the Eastern Company, and the directors of the Direct Spanish Company had at once met their views and would be very glad to receive the two gentlemen proposed. Sir James Anderson was the manager of the Eastern Company, and had had considerable experience in submarine cables. Mr. John Denison Pender was a young gentleman, the son of the Chairman of the Eastern Company, and he believed a director in the Eastern Company.

Mr. A. Scott seconded the motion.

Mr. Peter Atrell: What is the remuneration of the directors?

The Chairman: £400 a-year.

Mr. Atrell: Will it continue to be the same with the addition of the two gentlemen proposed?

The Chairman: I and my colleagues are perfectly willing that this addition to the board should impose no additional burden upon the shareholders.

Mr. Atrell said he was thinking, since they had got into so much difficulty, whether it would not be policy to liquidate and offer the property to the Eastern Company. The Eastern Company was an established company and no doubt would give them fair value for it. He did not see much prospect for the shareholders even after increasing their capital with the income they had.

Mr. Etlinger: Don't you think it would be wise to have an offer first before you liquidate?

Mr. Atrell said he would offer it to the Eastern Company first and then they would know whether they were disposed to buy it.

The Chairman explained that they could not take any action at that meeting upon any proposal of the kind suggested by Mr. Atrell, but the resolution they had just passed would in the future facilitate anything of the kind should the Eastern Company be disposed to treat in the matter, but there was a great deal to be said against what Mr. Atrell suggested. They could not, however, go into the matter that day. There were parties in addition to the two companies who would have a say in such a proposal. Their company had relations with the Spanish Government, and it was very doubtful whether it would be a consenting party.

Mr. Andrew Hunter: I should like to know whether this resolution, if adopted, will practically hand over the control of the Direct Spanish Company to the Eastern Company.

The Chairman: No, it will not. As the board will be constituted there will still be a majority of the original shareholders on the board. The control of this company and of every other company rests with the majority of the shareholders.

The motion was unanimously adopted, and

A vote of thanks to the chairman and directors closed the meeting.

The Globe Telegraph and Trust Company (Limited.)

THE tenth ordinary general meeting was held at Cannon Street Hotel on Friday of last week, Mr. John Pender, M.P., the chairman of the company, presiding.

The Secretary, Mr. W. Payton, read the notice convening the meeting, and the report of the directors, which we published in our last issue, having been taken as read,

The Chairman, in moving the adoption of the report and the declaration of the preference and ordinary dividends, as recommended, reminded the shareholders that the company had now been established ten years. What they put forward originally in their prospectus had, he said, been fairly fulfilled. They had in their company a combination of all the important telegraph systems connected with England, and he was glad to inform them that all the cables of those companies were at the present time in good working order—probably for the first time for some years. That was another satisfactory feature in the position of the company, whose dividends depended entirely on the dividends paid by the different telegraph companies whose shares they held. There had been extraordinary agitation from time to time by competition and threatened competition in connection with Atlantic telegraphy, but this company had received from the other companies steady and increasing dividends, which had counterbalanced any drawback from the disadvantage he had referred to. The value of all their investments, too, was increasing. In 1870 there were about 30,000 miles of cable, while in 1883 there were 82,000 miles.

Sir Daniel Gooch, M.P., seconded the motion.

The Chairman, in reply to questions, stated that they had been advised that there was no necessity for them to pay income-tax on their dividends. They merely distributed what they received from the other companies, who had already paid the income-tax. When the Eastern Extension Company issued their new shares this company was entitled to an allotment of 11,830 of them, and they took them up at £11 per share. They had thought it advisable on this occasion not to follow their usual rule and place on the market sufficient Globe stock to pay for the allotment, as they could easily obtain the money at 4 per cent. They received 6 per cent., which left them 2 per cent. to the good, and when the transaction was closed they expected, in addition, to make a profit of about £11,000. They therefore did not regard this as a bad temporary investment.

The motion was then carried unanimously, and the retiring directors and auditors were afterwards re-elected.

The Anglo-American Telegraph Company (Limited).—The report of the directors for the half-year ending 30th June says:—The total receipts from the 1st January to the 30th June, 1883, including a balance of £6,949 1s. 6d. brought forward from the last account, amount to £247,458 15s. 9d. The traffic receipts show an increase as compared with the corresponding period of last year of £36,333, consequent upon the resumption of the 2s. tariff. The total expenses of the half-year, including repair of cables, income-tax, &c., as shown by the revenue account, amount to £54,195 1s. 8d. The directors under the powers conferred upon them by the articles of association have, before declaring the net profits, set apart the sum of £75,000 to the renewal fund, leaving an available balance of £118,263 14s. 1d. to be dealt with. One quarterly interim dividend of 15s. per cent. on the ordinary stock, and of 30s. per cent. on the preferred stock, free of income-tax, was paid on the 1st of May, 1883, absorbing £52,500, and a second quarterly dividend at the same rates will be paid on the 1st August, 1883, leaving a balance of £13,263 14s. 1d. to be carried forward to the next account. The company's entire system of cables is now in good working order and condition. An arrangement has been made between the European cable companies and the Western Union Company, for the establishment of a cable office at New York, under the exclusive management of the cable companies. This office was opened to the public on the 22nd January last, and appears to have given general satisfaction.

The National Telephone Company (Limited).—The report of the directors for the year ending June 30th, to be presented at the third annual ordinary general meeting of the company, to be held within the offices of the company on Thursday next says: The directors have the satisfaction of being able to give conclusive indications of the company's prosperous growth and sound character. The capital expenditure for the year has been £43,047 16s. 5d., as against £42,360 13s. 1d. last year. The receipts from subscribers have increased so that the gross revenue allocated to the year ending June 30th, 1883, is £34,562 3s. 2d., against £19,243 10s. 11d., allocated to the preceding year, whilst the amount allocated and carried forward to the next year's revenue is £24,089 10s. 6d., against £15,643 5s. 5d. carried forward last year. The annual gross revenue of the company at the end of June, 1882, was £26,996 3s. 10d., and at the end of June this year, £43,111 5s. 6d., of which £4,988 10s. 3d. has been obtained during the last three months alone, and there are satisfactory reasons for expecting similar progressive development in the future. At the time of our last report nine exchanges only were included in the productive list, whilst since then all the twenty-six exchanges of the company have been placed in that category, thus justifying the anticipation put forth in last year's report. Last year £144 9s. 8d. was carried forward to the next account after providing the dividend on the preference shares. This year the profits of the company enable the directors to pay the dividend of 6 per cent. upon the preference shares, and to carry forward a balance of £2,530 16s. 6d. The directors desire to state that this result has been arrived at after deducting £684 10s. 6d. loss on trunk wires taken from the Postmaster-General. Owing to a more liberal arrangement of the Post-office terms for Trunk communication, it is anticipated that a similar loss will not recur, whilst on the other hand there is a probability of some profit being derived from the Trunk system. They also desire to point out that, owing to the establishment expenses being reduced in their *pro rata* incidence by the growth of the business, a larger proportion of the gross receipts will become net revenue each half-year. The company being brought into continual contact with the great department of which the Postmaster-General is the chief, it is with pleasure that the directors are enabled to inform the shareholders that the action of the department is marked by willingness to consider and accept proposals calculated to diminish the restraints upon telephonic enterprise when this can be done with advantage to the public and without detriment to the Post-office revenue. The relations of the company with the United Telephone Company, which has the arduous task of defending the telephone patents, are of the most satisfactory character, and the directors have pleasure in stating that the United Company has so far succeeded in maintaining the validity of its patents, and checking the hostile proceedings of those who have sought to invade its rights.

The Albo-Carbon Light Company (Limited).—At the general meeting of this company held on Wednesday, a dividend of 7½ per cent. was declared, making, with the interim dividend, 15 per cent. for the year, and a small balance was carried forward.

The River Plate Telephone and Electric Light Company (Limited).—This company announces the payment of an interim dividend of 9 per cent. per annum, to April 30 last, on the preferred shares.

The Cuba Submarine Telegraph Company (Limited).—The directors after providing for the dividend on the preference shares, and placing £3,262 to the reserve fund, recommend the payment of a dividend on the ordinary shares at the rate of 9 per cent. per annum for the past half-year, free of income-tax, leaving £3,265 to be carried forward.

LATEST QUOTATIONS.

Authorised Issue.	Share.	Name.	Paid	Closing Quotations. Aug. 1.	Business Done.
		ELECTRIC LIGHT.			
40,	10	Anglo-American Brush Co.	7	3½- 4	3⅝
		Do. Do.	10	6½- 7½	
30,000	5	Australasian Electric Light, Power & Storage Co.	3	⅛- ⅜	
24,900	10	British Insulite Co., Limited, "A" Shares	5	1½- 2½	
30,000	5	Brush Electric Light & Power Co. (Scotland)	2½	½- ¾	
25,000	5	Great Western Electric Light & Power Co.	2½	⅜- ⅝	
24,980	5	Hammond Electric Light & Power Supply Co.	2½	1½- 2	1⅞.13/16.15/16.¾
40,000	5	Indian & Oriental Electrical Storage Works Co. ..	2	..	
172,500	1	Maxim-Weston Electric Light and Power Co.	1	1/16- 3/16	
..	..	Metropolitan Brush Electric Light & Power Co. ..	3	..	
40,000	5	Pilsen-Joel & General Electric Light Co.	2	..	
..	..	South African Brush Electric Light & Power Co..	2½	..	
100,000	5	Swan United Electric Light Co., Limited	2½	1⅞- 2⅛	2
		TELEGRAPHS.			
2,116,400*l.*	Stk.	Anglo-American, Limited	100	47½- 48½	
2,441,800*l.*	Stk.	Do. Preferred } Def'd. receiving no div. until	100	78½- 79½	79¼
2,441,800*l.*	Stk.	Do. Deferred } 6 p. c. has been paid to Pref.	100	17 - 18	17½
130,000	10	Brazilian Submarine, Limited	10	11¾- 12	
16,000	10	Cuba, Limited	10	10½- 11	10⅞.11
6,000	10	Do. 10 per cent. Preference	10	17½- 18½	
13,000	10	Direct Spanish, Limited	9	5¼- 5¾	
6,000	10	Do. 10 per cent. Preference..........	10	15¾- 16¼	
65,000	20	Direct United States Cable, Limited, 1877	20	12⅜- 12⅝	12½ xd.
100,000*l.*	100	Do. 6 per cent. Debenture, repayable 1884	100	100 -103	
380,000	10	Eastern, Limited..................	10	10⅝- 10⅞	10⅞.13/16.¾.[illegible]
70,000	10	Do. 6 per cent. Preference	10	12½- 13	
232,000*l.*	100	Do. 6 do. Debentures, repayable Oct. 1883	100	100 -102	
200,000*l.*	100	Do. 5 do. do. Aug. 1887	100	100 -103	xd.
200,000*l.*	100	Do. 5 do do. Aug. 1899	100	103 -107	xd.
199,750	10	Eastern Extension, Australasia & China, Limited	10	11¼- 11½	
320,000	100	Do. 6 p. c. Debentures, repayable Feb. 1891....	100	106 -109	xd.
500,000	100	Do. 5 p. c. (Australian Gov. Subsidy) Deb. 1900	100	102 -106	
140,000	100	Do. do. registered, repayable 1900	100	102 -106	
100,000*l.*	100	Do. 5 per cent. Debenture, 1890..........	100	102 -105	
254,300*l.*	100	{Eastern and South African Limited 5 per cent. Mort. Deb. Registered redeemable 1 Jan. 1900}	100	102 -105	
345,700*l*	100	Do. do. do. To Bearer ..	100	101 -104	
22,050	10	German Union Telegraph and Trust Limited	10	9¾- 10¼	
163,390	10	Globe Telegraph and Trust, Limited..........	10	7⅜- 7⅝	7 7/16.½.9/16.7/16
163,209	10	Do. 6 per cent. Preference..........	10	12¾- 13	12¾
125,000	10	Great Northern	10	12½- 12¾	
100,000*l.*	100	Do. 5 per cent. Debentures	100	100 -102	
300,000	100	Do. 5 per cent. Debentures	100	101 -104	
31,200	10	India-Rubber, Gutta-Percha and Telegraph Works	10	29 - 30	xd.
100,000	100	Do. 6 per cent Debentures, 1886	100	103 -106	
17,000	25	Indo-European, Limited..................	25	32 - 33	
38,148	10	London Platino-Brazilian, Limited	10	3½- 4	
12,000	10	Mediterranean Extension, Limited	10	1¼- 1¾	1¾ ¼
8,200	10	Do. 8 per cent. Preference..........	10	2 - 4	3
9,000	8	Reuter's, Limited	8	9½- 10	
280,000	Stk.	Submarine	100	240 -250	
58,225	1	Do. Scrip	1	2¼- 2½	
4,200	Cert.	Submarine Cables Trust	100	104 -108	
37,350	12	Telegraph Construction and Maintenance	12	33 - 34	33 xd.
150,000	100	Do. 6 per cent, Bonds, 1884 ..	100	98 -101	
186,750	5	Do. 2nd Bonus Trust Cert. ..	2½	1½- 1⅞	
30,000	10	West Coast of America, Limited	10	4¾- 5¼	
150,000	100	Do. 8 per cent. Debentures	100	105 -108	
69,910	20	Western and Brazilian, Limited	15	5⅞- 6⅛	xd.
		Do. Preferred	7½	4¾- 5¼	xd.
		Do. Deferred	7½	1 - 1¼	
200,000*l.*	100	Do. 6 per cent. Debentures "A" 1910	100	102 -106	
2,500	100	Do. 6 p.c. Mort. Deb. series B of '80, red. Feb., 1910	100	95 -100	xd.
1,500	$1,000	Western Union of U. S. 7 p.c.1 Mort.(Building) Bds.	$1,000	122 -124	
1,030,000*l.*	100	Do. 6 per cent. Sterling Bonds	100	103 -106	
88,321	10	West India and Panama, Limited	10	1 - 1¼	xd.
34,563	10	Do. 6 per cent. 1st Preference	10	6¼- 6¾	
4,669	10	Do. 6 do. 2nd do.	10	5 - 5½	
		TELEPHONES.			
154,165	1	Con. Telephone & Maintenance, Ld. Nos. to 154,165	1	¼- ½	
200,000	1	Oriental Telephone Co., Nos. 80,001 to 300,000 ..	½	¼- ½	
100,000	5	United Telephone Co.	5	8¼- 8¾	xd. & x. new

NEW PATENTS—1883.

3424. "Galvanic batteries." J. Gray. Dated July 12.

3444. "Improvements in electric lighting apparatus and in the means for generating, regulating, distributing, and measuring the electric currents." J. L. Clerc. Dated July 13.

3451. "Electric batteries and lighting apparatus." P. de Villiers and E. F. Rey. Dated July 13.

3452. "Secondary batteries or accumulators." F. Maxwell Lyte. Dated July 13.

3457. "Electric machines." W. S. Frost. Dated July 13.

3459. "Voltaic batteries." A. Clark. Dated July 13.

3464. "Electric current switches and cut outs." H. J. Haddan. (Communicated by C. G. Perkins.) Dated July 13.

3465. "Improvements in electric incandescent lamps, and in switches for same." H. J. Haddan. (Communicated by C. G. Perkins.) Dated July 13.

3466. "Apparatus for treating carbon filaments." H. J. Haddan. (Communicated by C. G. Perkins.) Dated July 13.

3470. "Store service apparatus." H. J. Haddan. (Communicated by H. H. Hayden.) Dated July 13.

3475. "Recording and controlling a supply of electricity." J. Hopkinson. Dated July 13.

3478. "Means or apparatus for connecting or disconnecting portions or parts of conductors used for the passage of electric currents." C. A. Carus-Wilson. Dated July 14.

3487. "Soldering joints of wire of all sizes and of different descriptions particularly telephonic or electrical, and copper and brass tubes whether exposed to the air or not, and for melting lead and other metal for soldering and other purposes." J. T. Neighbour. Dated July 16.

3495. "Chemical deposit current meters used in charging and discharging accumulators employed for storing electricity." Sir D. Salomons. Dated July 16.

3505. "Telephonic apparatus." J. Graham. Dated July 17.

3516. "Electrical signalling apparatus, chiefly designed for telephonic purposes." W. R. Lake. (Communicated by J. H. Cary.) Dated July 17.

ABSTRACTS OF PUBLISHED SPECIFICATIONS, 1882.

4738. "Meters for recording quantity of electricity." A. E. Porte, J. Lesware, and J. Chancellor. Dated October 5. 2d. To a switch lever is attached an arm that impinges on the balance lever of a clock movement in such a manner that when the switch lever is depressed and the current allowed to pass through the lamp or lamps the registering wheels are thrown into action and this continues to register so long as the current passes. The current is caused to cease by the switch lever being raised and the movement is stopped in such a way that the balance wheel is carried beyond its dead point, and so can start of its own accord when the lever is depressed and immediately the current passes. The switch lever itself can also be made to pass over and press upon metal studs throwing in compensating resistances. (*Provisional Protection not allowed.*)

5625. "Telephonic apparatus, &c." J. B. Spence and J. E. Chaster. Dated November 27. 2d. Has for its object the improvement of existing telephonic apparatus. First, the inventors find that certain metallic sulphides of homogeneous nature form excellent material with which to vary passing currents in microphones and telephones, the sound being thereby largely increased without injuring materially its distinctness. In order to make them homogeneous they prefer to fuse them and cast them in the form required. Various sulphides, pyrites or blendes will do but as they are almost invariably not homogeneous in their natural state it is found necessary in most cases to fuse the material. The variety the inventors have found to suit best in their experiments hitherto consists of 32 parts by weight of sulphur to 56 of iron fused into it so as to be homogeneous, but ordinary or magnetic pyrites even when contaminated with arsenic and other metals will, if fused and cast without flaws or dross, be found to answer nearly as well—but the silica, carbonite of lime, or magnesia almost always present in these materials must be eliminated or dissolved in the mass to enable it to be available, and it is better to form the materials synthetically and thus avoid them altogether.

5742. "Electric and magnetic apparatus for telephonic purposes, &c." S. P. Thompson and J. D. Husbands. Dated December 1. 4d. Relates to electric and magnetic apparatus, and is applicable for telephonic and various other purposes. The invention consists in utilising, as means for producing mechanical movements, the property of differential magnetic expansion and contraction, that is to say, the action due to the different degree or amount of expansion or contraction of different metals when magnetised or acted on by magnetic forces. There are some metals, for example, iron, steel, and cobalt, which, when magnetised, expand or elongate in the direction of the magnetising force. There are others (for instance, nickel) which contract when magnetised, and there are other metals, such as brass, silver, zinc or tin, and other hard bodies, such as ivory, horn, wood, or glass, which, when subjected to magnetic forces, are indifferent, that is to say, they do not become magnetised and neither expand nor contract. Now, the inventors find that if in any apparatus, instrument, device, or structure, pieces or parts formed of such metals are so combined that, when subjected to a magnetising force, some part of the structure is thereby caused to elongate, whilst some other part is caused to contract, movements or displacements ensue, which, if properly utilised or turned to account, may be caused to impart motion with greater effect than could be obtained by the mere expansion or contraction of any single metal. (*Provisional only.*)

5744. "Apparatus for automatically regulating electric currents." J. T. King. (A communication from abroad by J. R. Finney, of America.) Dated December 2. 8d. Relates to apparatus or appliances for automatically regulating electric currents supplied to a circuit by a dynamo-electric machine or other generator of electricity so as to render the said currents proportionate to the work to be done. The invention consists essentially in the combination of a bar, needle, core helix, electro-magnet, or like appliance constructed and arranged to receive motion from the passage of an electric current through a main or subsidiary circuit with a movable brush, contact-maker, or equivalent. The above-mentioned bar or like appliance is connected to the brush or equivalent by means of pulleys, cords, wires, levers, or other suitable devices, and the brush or equivalent is arranged to move on a lever slide, or as may otherwise be desirable in contact with the armature or other part having like functions of a dynamo-electric machine or source of electricity, say, such as an accumulator or battery. Springs, weights, or stops may be used to control the extent of motion of the parts. The action of the apparatus is as follows:—Any variation in resistance of electric current in a main or subsidiary circuit due to the lighting or extinguishing of lamps or otherwise, causes motion to be imparted to the bar or like appliance above-mentioned. The motion of the said bar or like appliance is communicated through the connections to the brush, contact-maker, or equivalent, and the relative position of the said brush, contact-maker, or equivalent, and the armature or part having like functions, is so altered that the quantity of the electric current passing through the main or subsidiary circuit is increased or diminished to the required extent. When used for lighting the connections are reversed, according as the main or subsidiary circuit is arranged, to operate in multiple arc or in series.

5747. "Apparatus for generating and utilising electric energy." A. J. Boult. (A communication from abroad by B. Faquant, of America.) Dated December 2. 4d. Relates to improvements in electric engines or motors to the means of generating the electric force and to the means of rendering the operation of the motor automatic. The object of this invention is the construction of a motor which shall be automatic in its operation, in other words so constructed that being once set in motion it will generate or cause to be generated sufficient electric force to keep the machine in motion and supply power and electricity for other purposes. The invention consists in the novel construction and arrangement of the parts whereby the power is generated, stored, and conveyed to the working parts and whereby the machine is rendered automatic in its operation and in the various details for controlling the several parts.

5757. "Manufacture and preservation of insulated electric conductors, &c." E. T. Truman. Dated December 2. 4d. Consists in employing as the insulating material of insulated electric conductors an improved compound consisting of black lead of commerce ordinarily termed plumbago or graphite combined with a good insulator such as gutta-percha, or india-rubber or ozokerit. The improved compound enables the inventor to provide an insulator of greater durability and hardness and one less affected by heat and other injurious influences than ordinary insulators formed of compounds hitherto used. The inventor is also able to produce a much cheaper insulated conductor than when ordinary insulating material, such as gutta-percha for example is employed. The proportions of plumbago used will vary according to the particular purpose for which the conductor is intended; from about 20 to 50 per cent. will for many purposes be a suitable proportion. Instead of mixing the black lead, plumbago or graphite with other insulators, the inventor sometimes applies to the conducting wires a layer or layers of black lead, plumbago, or graphite and a layer or layers of other insulators alternately, or he applies a layer or layers of a mixture composed of black lead, plumbago or graphite and other insulators and a layer or layers of other insulators alternately.

5767. "Accumulators or secondary batteries." W. A. Barlow. (A communication by Messrs. L. Encausse and Canèsie, of Paris.) Dated December 4. 6d. Relates to improvements in accumulators or secondary batteries, the object being to compose such accumulators or scondary batteries of specially formed distinct elements which may at will be arranged for intensity or quantity and also that they may be isolated one from the other for obtaining separate or divided currents. Fig. 1 represents one of the elements unmounted, fig. 2 is a section of one of the elements showing the disposition of the electrodes and the plates for mounting sectioned M and N. In constructing the elements of these accumulators, a thin sheet of lead is rolled around so as to have great length of spiral, and in the centre of this roll, A, is arranged a strip of lead, B, which extends out at each end of the roll for a certain distance and this roll is next coiled or wound around by properly insulated wire as at C, and on to the two ends of the spiral are fixed two rings of india-rubber, D. Upon this body there is rolled a second sheet of thin lead, E, which will cover the coil and the india-rubber end rings, and in the last turn of this second roll of lead, E, there is placed a strip of lead, G, extending out at each end from the sheet lead roll and upon said lead roll a second coil or winding of insulated wire, H, is placed and the element is complete. It is to be remarked here that plain sheet lead is not employed; the sheets are covered with an insulating varnish and the surfaces of the spirals are not in contact the one with the other. The so constructed elements, are mounted between two end plates or rails, M, N, between which any required number of elements may be disposed or arranged as desired. These said plates, M, N, are composed of two parts upper, *m* m^1, and lower, *n* n^1, between the adjacent faces of which parts are placed sheets of flannel. The electrodes in the lower of the end plates, N, are placed directly and indiscriminately upon the sheets of flannel and are not in direct contact one with another, but in the case of the upper end plate the electrodes are arranged for tension, that is to say, connected up in opposite poles but in contact with the flannel. The electrodes in the said upper end plate, M, are divided in two and form two distinct circuits and having at each of their extremities contact terminals. The upper and lower plates or rails, M, N, carrying the elements are held together by bolts, K, or in any other convenient manner. The flannels are kept wet with acidulated water. Upon the upper end plate, M, are fixed four terminals corresponding to the two circuits, two terminals of the same circuit serving for the charging of the accumulator and the two others for the discharge.

FIG. 2.

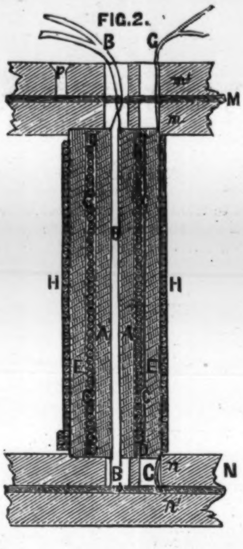
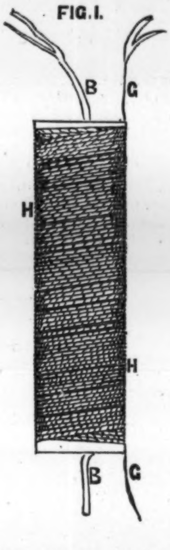
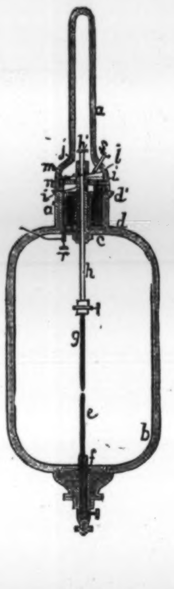


FIG. I.



5783. "Magneto and dynamo-electric machines." W. A. Barlow. (Communicated by W. E. Fein, of Stuttgart.) Dated December 5. 2d. Relates to certain improvements in magneto and dynamo-electric machines, the object being to make the greatest possible use of the wire coils of the induction ring in a magneto and dynomo-electric machine, the construction of the iron core of the ring in consequence of which the inversion of its polarity is facilitated, the production of Foucault currents prevented a continuous cooling effected as well as an arrangement of apparatus which permits of an easy regulating of the position of the brushes and of their pressure on the commutator. (*Provisional only.*)

5796. "Electric lamps." W. R. Lake. (Communicated from abroad by R. H. Mather, of America.) Dated December 5. 6d. Relates chiefly to the carbon-feeding mechanism of an electric arc lamp, and comprises simple devices for attaining the desired end, a perfect and reliable lamp and practically steady light. The inventor makes use of a spring clamp which supports the upper carbon and releases it automatically as the carbon is consumed. The clamp has, appurtenant to it, the armature of a shunt-magnet and of a switch-magnet. The inventor also avoids the many parts and laborious method of fastening these parts together by means of rods and nuts, as in the ordinary form of lamp, by casting the frame of his lamp of suitable metal, such as iron in but two parts, which are cheaply and easily united. The operation of the improved lamp, which is shown by the figure, is as follows, that is to say:—A current of electricity from any suitable source (such as a battery or dynamo-electric machine in which the whole current is caused to flow through the external circuit) is passed into the lamp at the post, p^1, and, as the carbons are not in contact, through the coil of the shunt magnet, *d*. This current magnetises the core, *c*, very strongly and draws down the armature, *i*, and the appurtenant spring clamp, *l*, and allows the rod, *h*, and the upper carbon to slip down by the action of gravity until the upper carbon makes contact with the lower carbon. The main portion of the current then passes through the carbons, and only a small portion of it through the coil of the shunt magnet, thus releasing the armature and the spring clamp, which, springing up, grips the rod, *h*, lifts it, and slightly separates the carbons. The circuit through the carbons is now the shortest path for the current, the arc is formed and the points of the carbons become incandescent and are consumed. In proportion as the carbons are consumed and the distance between them increases, the strength of current through the coil of the shunt magnet is augmented and the armature is drawn down, and with it the rod, *h*, until the said rod is released from the spring clamp, *l*, and the rod and carbon fall. The rod and carbon continue to fall until the current through the shunt magnet is decreased by the shortening of the arc, the armature is then released, and the clamp again holds the rod. If the carbon should fall too far, that is to say, so as to strike the lower carbon, the recoil of the spring clamp is sufficient to separate the carbons and form an arc of the proper length. The inventor provides for the automatic extinction of any light in a circuit by using the switch magnet placed as above described, and having one end of the coil attached to the frame of the lamp at the post, p^1, and the other end to the soft iron core of the magnet. When the upper carbon is nearly consumed the button, h^1, strikes the top of the loose sleeve, j, which rests on the spring clamp, l. The carbon now fails to feed when the armature is depressed, and the strength of the current through the shunt magnet increases with the length of the arc as the carbons are consumed; the armature is, therefore, pulled down until its projecting portion, i^1, comes into contact with the core of the switch magnet. Instantly, through the coil of the switch magnet, a new circuit is formed, magnetising the core and retaining the armature in its depressed position. At the instant when the armature strikes the core of the switch magnet there are three circuits open for the current, one through the carbons, a second through the shunt magnet, and a third through the switch magnet. The latter forms a short-circuit and the light goes out without extinguishing any other lamp that may be in the same circuit.



5797. "Primary voltaic batteries." T. J. Jones. Dated December 5. Relates to improvements in primary voltaic batteries. The invention consits in the construction of voltaic batteries formed of a porous vessel containing a suitable electrolyte, in which is immersed a positive element, preferably of zinc, the acid porous vessel being surrounded by a plate of metal constituting the negative element, and preferably both corrugated and perforated, so as to allow access of atmospheric air to the inner surface of the element with a view to utilise the depolarising effect of the atmospheric oxygen. The perforations and corrugations or grooves serve the threefold purpose of allowing contact between the negative element and the porous vessel only at a number of points or along a number of lines in close proximity of providing for the depolarising actions of the air, and of retaining the electrolyte at the surface of the porous vessel. (*Provisional only.*)

5814. "Apparatus for igniting gas by electricity." J. A. Koerber. Dated December 6. 2d. The inventor employs a cylindrically-shaped vessel, which in itself constitutes the negative element of the battery; which said battery he forms by inserting in the aforesaid cylindrically-shaped vessel the usual elements used to form the positive pole, the said cylindrically-shaped vessel is therefore made of zinc. The inventor now attaches a tube of any convenient length, but preferably about twelve inches to the upper end or lid of the said vessel, and he leads to the extreme end of the said tube a wire for the purpose of leading the said current to the said extreme end; at such end he attaches an exceedingly minute piece of platina wire, which wire becomes incandescent on completing the circuit, which said circuit he completes by pressing a small knob or button placed at the top of the cylindrically-shaped vessel, or in any other place that may be found most convenient. (*Provisional only.*)

5833. "Incandescent electric lamps." J. Wavish and J. Warner. Dated December 6. 2d. Has for its object to prevent the rupture of the glass stems of incandescent electric lamps, which frequently occurs at the part where the wires pass through the said stems. In constructing the said lamps according to the invention the stem of the lamp is formed with an enlarged tubular part forming the termination of the ordinary stem part around which latter part is placed a screwed ring or flanged collar piece. Around the larger lower part is a cup or box-like cylindrical piece closed at bottom and screwed at top. In the said box or cup is contained a piece or block of an elastic material, such as vulcanised india-rubber. The terminal wires leading to and from the filament of the lamp are led through this cup or box and through the block of elastic material. On the flanged collar and the cup or box-like piece being screwed together the elastic material contained in the said cup or box-like piece is forced into close contact with the part of the stem at the junction of the ordinary stem part with the enlarged termination thereof, the said junction at this part being preferably formed into an acute angle to embed itself firmly and air-tightly in the elastic material. Any suitable cement may be used between the parts to further secure the air-tight character of the lamp, which may be exhausted after the ordinary manner. (*Provisional only.*)

5861. "Gaso-electric lamps." P. M. Justice. (Communicated from abroad by J. H. Loder, of Brussels.) Dated December 8. 2d. The lamp, according to this invention, is formed in a manner somewhat analogous to that of a Bunsen burner, in the flame of which are two or more carbon rods through which the electric current passes. (*Provisional only.*)

5866. "Electric commutators." J. Gordon. Dated December 8. 4d. Relates to a construction of commutator segments in such a manner as very greatly to reduce the friction and wear attending their use. For this purpose the inventor drills along each segment a row or several rows of holes and in each hole he fixes a plug of anti-friction material, such as that known as metalline.

5926. "Applying electric currents to organic bodies, &c." H. Haug and A. Wienand. Dated December 12. 8d. This invention relates chiefly to an improved mode or method, called the bisolenoïdal-electric method of applying electric currents of any origin to organic bodies of any kind, and to derivations of them, as eggs and seeds, for breeding, healing and other purposes; and it relates also to improved constructions and arrangements of, and modes of applying, instruments and articles of wear, for carrying out the said bisolenoïdal-electric method.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer, not necessarily for publication, but as a guarantee of good faith.

Letters, &c., for the "Correspondence" columns should arrive not later than Tuesday morning if they are desired to appear in the following number, such communications to be addressed to the "Editors," Electrical Review, 22, Paternoster Row, London, E.C.

Letters respecting Advertisements, Subscriptions, &c., should be sent to the "Publisher," Electrical Review, at above address.

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CORRESPONDENCE.

Lightning Marks.

Referring to the letter of Mr. Bruce in your last issue, regarding marks resembling the foliage of trees made on the bodies of some boys lately struck by lightning at Cairnbank, will you allow me to state that in a similar case that happened at St. Riom, in Auvergne, on May 10th, 1785, Arago, in a note on the subject published in 1843 (*Comptes Rendus*, vol.. xvi., p. 1328), attributed the peculiar marks to the fact of the blood having been forced into all the vessels of the skin, whereby the ramifications of these vessels were clearly manifested? I think that other *savants* have also at different times given the same opinion on the origin of these foliage-resembling marks occasionally left by lightning on persons struck; but I cannot at present denote these scientists.

A. Parnell.
Colonel (late Royal Engineers).

13, Windsor Terrace, Newcastle-on-Tyne,
July 25*th*, 1883.

Underground Work.

The other week you invited your readers to discuss technically and commercially the subject of "Overground *versus* Underground Wires." But one response has been made to that invitation, doubtless due to those best qualified to enter the arena being intent on subjects rural, deeply immersed in sixpenny tariff arrangements, or wholly occupied with revolutionary subterranean ideas. While our "men of light and leading" are so engaged we whose lights glimmer feebly may have an innings.

It is now universally believed that the day is not distant when the telephone companies will be called upon to put all their town wires underground, which of course means an increase in the number of pipes beneath the surface of our streets.

The cast-iron pipes used by the Post-office are to outward appearance exactly the same as those used for the gas and water services. The telegraph, water, and gas pipes generally run parallel, and when the necessity for breaking a telegraph pipe arises, there is some trouble in finding, before a blow is struck, which is Daniel and which are the lions. With gas and telegraph pipes the difficulty is not so great as with telegraph and water pipes, as in the former case the olfactory organ is a reliable guide; but if the Post-office description of pipe is adopted by the telephone companies the lineman's peck of troubles will be increased. Would not the danger of breaking the water and telegraph pipes in error be minimised, and the work of repair generally facilitated by the adoption of a distinguishing mark? The mark might be three or more grooves on two sides of the external surface of the pipes, the lines being so shallow as not to appreciably weaken the strength of the pipes. Again, when the Post-office people are pulling cables into their pipes, I notice they use General Post-office mouthpieces to protect the coatings of the wires from the edges of the pipe's mouth. What objection is there to the use of box-terminating pipes with half-bell mouths? It is obvious that under the present system if we begin at a box with a faucet end we finish at the next box with a plain end, or, as is not unfrequently the case, a broken end, which is worse. It would therefore appear that half-bell mouthed terminating pipes might be advantageously adopted. These terminating pipes could be of two lengths, one yard and two yards, and while some of them had the opposite end plain, others could be fitted with a faucet for jointing purposes.

A cry which is already heard in the land is the interruption street traffic will sustain by the continual opening of the streets for the repair or increase of underground wires. Telephone companies will have to consider how they best can meet the demands of our civic rulers, and at the same time insure easy and speedy access to their wires. These objects, I venture to think, would be attained by the employment of flush boxes. The pattern of flush box now issued by the Post-office is very good; the close-fitting cover excluding wet and dirt, and the tray on which the box stands keeping the wires clean below. As the depth of the box is only some twelve inches it is necessary in town work to build a box on the tray of sufficient height to allow the metal box to stand on it and be flush with the causeway. The cast-iron cover is too strong for the footpaths, while it is too weak for the carriage ways. All, however, that appears necessary to make this cover available for both purposes is that it should be of wrought iron and supported by three movable cross bars. For joint boxes the size of course depends on the number of wires to be led into them.

In these days of concrete pavements and concrete causeway bottoms, the lifting and relaying of streets is very expensive work. The other day I asked a public contractor how much he would ask to open a track two feet deep and half a mile long, cover in, and make good again. He replied, after some consideration, from 9s. to 10s. 6d. a yard, because it will be easier to break the stone blocks than the concrete bottom. This case is exceptional, but the general price may be put down at from 4s. to 6s. a yard.

Trusting the foregoing will encourage some one better acquainted with this description of work than myself to speak, I am,

Fareham.

28th July, 1883.

The United Telephone Company and its Claim to the Exclusive Use of Carbon in a Transmitter.

Your curt remarks on two statements made by me in my letter published in the Review of 28th ult. tend to impair materially the weight of the evidence which I cited to prove the "dishonest and false claim" made by the United Telephone Company to the exclusive use of carbon in a transmitter. I am surprised that you should have been so hasty to call in question the accuracy of my statements.

You state "our Correspondent has apparently confounded examination in the Scottish court with the judge's decision." I respectfully submit that I have not "confounded the examination in the Scottish court with the judge's decision." My words were, "does not the judgment of Lord M'Laren decide that the use of *carbon* in a regulator without a tympanum or diaphragm to be without the patent?" You will find in the judgment delivered by Lord M'Laren these words:—"Now, as Edison's patent is for a tension-regulator in combination with a diaphragm or tympanum, it follows that the interdict would not apply to the use of the respondent's *carbon* regulator without a tympanum."

In regard to your remarks on my statement of what Mr. Justice Fry said about the claim of the United Telephone Company to the exclusive use of carbon in a transmitter, I do not agree with you that Mr. Justice Fry's statement that "the company was not honestly asserting its rights" "referred only to the Hunnings transmitter." The case in which Mr. Justice Fry used these words was on "a motion to commit certain directors and officers of the United Telephone Company for issuing an advertisement in an alleged breach of injunction." The injunction was, no doubt, applied specially to the naming the Hunnings transmitter in the notices published by the United Telephone Company. Now, that transmitter had been adjudged to be the combination of a tension-regulator made of carbon with a diaphragm, and to be an infringement of Edison's claim to that *combination*, hence it is evident that, according to Mr. Justice Fry's decision, the use of carbon without a diaphragm is without Edison's patent.

"Mr. Cozens-Hardy, Q.C., moved on behalf of the United Telephone Company to discharge an order which had been made in this action, restraining their issuing advertisements in a form which implied that Hunnings' and *other carbon transmitters* could not be manufactured or sold without their licence."

It is upon that claim Mr. Justice Fry said "the company was not honestly asserting its rights." Now, that claim by the United Telephone Company included "other carbon transmitters" besides that of Hunnings. Mr. Justice Fry also said "he considered the advertisement drawn up with great ingenuity in a way calculated to mislead persons who were not conversant with what had happened." What is it which had happened which Mr. Justice Fry alluded to? Evidently to the broad claim by the United Telephone Company to the exclusive use of carbon in a transmitter in the face of the judgment previously given by him that Edison's claim was for a *combination* only, and the United Telephone Company in claiming the exclusive right to use any *part* of the combination "was not honestly asserting its right," and "the advertisement by the United Telephone Company was calculated to mislead."

W. C. Barney.

July 30th, 1883.

Electrical Navigation.

Is there not some mistake in the note contained in your journal of July 21st, on "Electrical Navigation?" It there states that a screw 18 in. diameter and 13 in. pitch made 680 revolutions per minute, which (*without slip*) would be 44,199 ft. per hour. It also states that the pace of the boat was $7\frac{1}{2}$ knots per hour, which is 6,022·66 ft. × $7\frac{1}{2}$ × 3, 45,619 ft. per hour, or 1,420 ft. per hour more. Now, my experience with the electrical boat, the *De la Motte*, the propeller of which is the first to my knowledge ever coupled directly on the shaft without gear, gives 30 per cent. slip; this, together with the 1,420 ft. added to the speed of the screw, would make a very material diminution of the speed attained.

18, Malvern Villas, Willesden,
August, 1883.

E. Toynbee.

[We stated in the note alluded to that we were not sure of the correctness of the figures given. Perhaps Mr. Reckenzaun will reply to our Correspondent's letter.—EDS. ELEC. REV.]

Thermopiles and Electric Lamps.

Pressure of business has prevented us from replying to yours of the 21st inst., and if you will please refer to our circular you will see that we are not prepared to deliver the Woodward's thermopile until after the first week in October next.

As you have asked us to give you the results of Dr. Woodward's thermopile generators, we beg to say we shall be happy to do so, for the benefit of your readers, as soon as the printed particulars are issued by us respecting this invention; when the same shall be supplied to you for publication as requested.

Respecting your further allusions to the Universal lamp, all we can say as to this is, that we are still of opinion that it is the best lamp in the English market.

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Electric Lighting by Incandescence.

In the various accounts which have been given of the history of incandescent lighting, it seems curious that the claims of Sir William Grove appear to have been hitherto passed over.

In the *Philosophical Magazine* for 1845 (3rd series, vol. xxvii. page 442) will be found a description of an incandescent light for mines, together with a *résumé* of experiments upon the effect of surrounding the incandescent wire with various kinds of gases. Mr. Grove's description of his apparatus is as follows:—

"The following was one of the apparatus I used for this purpose and by the light of which I have experimented and read for hours. A coil of platinum wire is attached to two copper wires, the lower parts of which, or those most distant from the platinum, are well varnished; these are fixed erect in a glass of distilled water and another cylindrical glass, closed at the upper end, is inverted over them, so that its open mouth rests on the bottom of the former glass; the projecting ends of the copper wires are connected with a voltaic battery (two or three pairs of the nitric acid combination), and the ignited wire now gives a steady light, which continues without any alteration or inconvenience as long as the battery continues constant, the length of time being of course dependent upon the quantity of the electrolyte in the battery cells."

A remarkable effect of hydrogen in diminishing the light from a wire which it surrounds is also noted. These experiments are stated in the above paper to have been made in 1840—41, shortly after the publication of Grove's battery; see also *Phil. Trans.*, 1849, p. 49. Here, therefore, we have one of the first instances on record of a trial of incandescent lighting, which shows that the genius who first designed the form of battery which bears his name may also claim to be one of the first to have conceived the idea of applying voltaic electricity to electric lighting.

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